The Province of Alberta

PETROLEUM AND NATURAL GAS CONSERVATION BOARD

IN THE MATTER OF THE GAS RESOURCES PRESERVATION ACT

AND IN THE MATTER of a Joint Hearing to determine various questions relating to the proposed Export of Natural Gas from the Province of Alberta.

I. N. McKinnon Esq., Chairman

D. P. Goodall Esq.

Dr. G. W. Govier

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W I T N E S S E S

E X H I B I T S

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9.30 A.M. Session.

RALPH E. DAVIS (Continued)

Q BY DR. GOVIER: Mr. Davis, did you have an opportunity to give any further thought to the questions we were discussing yesterday on economic well spacing?

A Yes, sir.

Q Perhaps we can have your further views?

A Well, I ran some pencil figures out to illustrate the way things might go. It seems that we have this information that based upon potential tests of the wells in the Kinsella part of the Viking-Kinsella field, a test made in 1949, the average open flow potential, based on a 10-day stabilized basis, would be 10-4/10ths million feet per well. You would have in mind that is higher than the figure would be were we to include all the old Viking wells. If we assume that the wells have an allowable production of 25% of their stabilized open flow, this figure for these 43 wells would be 2-6/10ths million feet per day. Northwestern Utilities have been operating on a load factor of about 44%. So that if we assume that the average well was operated on a 44% basis that would be 2-6/10ths million times 44% and then for 365 days a well could be expected to produce about 417 million cubic feet of gas in a year. To make this calculation short, and not presenting it as an accurate figure in detail, I assumed that the deliverability would in 20 years decline essentially in a straight line. I know that it would not do that. But at the same time I do not know how it would decline, because

it would depend upon certain variables, among them the amount of gas taken out year after year and that becomes an increasing amount in the later years. In any case, I assumed that the gas would be produced at the rate of 417 million in the first year and zero in the last year. So that over a 20-year period a well would on that basis produce 4-17/100 billion cubic feet, the arithmetic of course being 417 divided by 2 and then multiplied by 20. My estimate of the total recoverable reserves at January 1, 1950 has been given to you as 612.5 billion cubic feet, and were the average well to produce this quantity of 4 - 17/100 billion, you would divide the 612 by 4.17 and the answer is 147. That is an indication, a rough indication of how many wells may be required to take out the 600 billion cubic feet in 20 years. I suspect it would be more than that number of wells if we got down to really accurate figuring but I wanted to approach this without attempting a thoroughly scientific detailed study. I do not believe that the basic data permits a thoroughly scientific detailed study. We have to make many assumptions. All right. Now that happens, by accident, to coincide very closely with my rough estimate made a few days ago of 150 wells required. The money side of this thing. If a well be drilled out there today the cost would be in the order of $30,000 and if that well be hooked up to the main gathering system on the wide spacing that is in vogue, the gathering line would cost about $20,000. In other words, to put a new well on the line out there involves an outlay of about $50,000 and if we wish to make this assumption that

the gas at the well head in the field is worth 5 cents, we can make a rough approximation. The deduction for royalty and the cost of taking care of the well, the operation, I was inclined to estimate that figure at 1 cent per Mcf.

Q That would cover all the operating costs?

A Well, it would when the well delivers 400 million feet a year, but when we get down to 100 million feet a year, I think not. But at any rate that is the figure I used and used through the 20 years. I think the figure would turn out to be low over a long time. So that gives you 4 cents on my assumption. The gross income after royalty and operating expense for the 4-17/100 billion cubic feet of gas, that would amount to $166,800. My understanding of the tax laws at this time - I am assuming this well is owned by a corporation - 25% of this income would be tax free. That would be $41,700.

Q What was your previous figure again, Mr. Davis, please?

A $166,800. Let 25% of that sum be tax free, $41,700 and the remaining three-quarters taxed at 43%, that would leave 57% in possession of the owner. The amount would be $71,200. Add my 41,700 and 71,200, it adds up to $112,900. Now that would be the returns that the owner would receive after having invested somewhere between $30,000 and $50,000. As the thing is being operated today it would be $50,000. But of course as more wells are drilled the distance becomes less and it might have been well to assume an average investment at something more like $40,000. But in any case it would seem to me that the man, regardless of what his well cost, a dollar or a hundred thousand dollars, he could

expect to take in on the basis of 5 cents for gas and keep $112,900. Now out of that he must of course amortize his investment. I do not know how that looks to other people but that does not look like a very attractive investment to me. That is, I would not be very fortunate if I went down among the gas people in the States and said, "I have a place where I can take a farm out of 50 square miles and drill 50 wells and that is what I say they are going to do." I do not believe I would come back with enough money to drill any of them if that is all I could do. Now you can make any assumption you want to as to what gas is worth. If you want to take 10 cents instead of 5 cents, you get - of course your royalty would be doubled. The operating expenses should not. Instead of having 112,900 you might have a figure of close to 200,000 dollars that you could expect to get from an investment of 30, 40 or 50 thousand dollars. However, I think I could get the money to do that job. That would be all right. What that indicates is, in my mind, in a field like Kinsella as she is today, with the expected production, with the time required for pay out, indicates to me that 5 cents is a low figure to assume as the value of gas in the field. But maybe I am getting astray. Maybe that is not the question you wanted to discuss.

Q Mr. Davis, would it be fair to say this that your opinion is that if gas is sold in the field for 5 cents, somewhere around 150 wells is just about the borderline from an economic viewpoint that you consider the return to an individual well?

A I think that is true.

Q And at 6 cents it would become definitely on the attractive side, is that about right?

A Not too definitely.

Q Would it become barely attractive?

A Yes.

Q I think the Board understands your viewpoint there, Mr. Davis. Now I wonder if you have given any thought to the other aspect of the problem and that is, suppose instead of looking at the individual well economics we look at the over-all economics of the protection of the utility system against peak loads, and consider all the incremental costs of drilling additional wells to protect the system, much the way we might consider the incremental cost of buying a new tire for an automobile to protect the whole automobile?

A Now I did not make any pencil figures on that problem, but I recognize the principle that you have suggested. I realize that this utility with, let us say, 100 wells, and the need for more wells in order to meet peak loads, must drill those wells. That is to say, the people require it and their present investment demands protection. I do not know just what is fair in that regard. I know that people put their money into these things and feel that they are going to be treated fairly and be permitted to earn what at the time is considered for that kind of business a fair return, and if we require them to drill 25 wells where the return is only 5%, in order that they may maintain the rest of the facilities in oper-

ation to earn 7½%, well and good. I think we are squeezing them a little myself. I think they are entitled to a fair return on their investment. I do not assume that each and every well must be considered by itself. Not at all. I think any Utility Board would pass upon the over-all picture when the time came, and that would include wells which would cost $40,000, which individually may not make any return. Individually. Wells drilled in the late period of a field history could hardly pay out. I have indicated here that I think wells that are going to be required in the Kinsella area in all probability should be and will be drilled in the next 10 years and not over a long period of 25 years. We have got to get the good out of them. We have to have them on the line long enough to do that.

Q I appreciate how desirable that would be but I cannot help but think of the fact that if a man had an old automobile which only had one year of life left still might buy a brand new tire to keep that automobile running for that last year. I just wonder to what extent that concept might tend to increase your figure of 150 wells or if in your opinion it would not increase it. That is all I would like to know.

A I think the only reason - - As I see it today, I do not know what the picture will actually unfold into. We might find the new crop of wells next year are better than we might expect. They may not be as good. I do not know how this will unfold. My conception of it is, as I see it today, that 150 wells is about all that - well, let us put it this way, that the people of Edmonton should desire their

utility to drill, if the people of Edmonton are going to treat the utility as they would be treated themselves. I guess that is the way. If it be good business, when the time comes, to drill 175 wells in all, that will be done. I am only trying to judge now what it seems to me is probable.

Q Well that is fine, and thanks very much. Now there were two other questions I wanted to ask you, Mr. Davis. I believe I mentioned one of them just after we adjourned yesterday. The question is this. What, in your opinion, is the possible role of storage projects in the future operation of the utilities' systems, and particularly in relation to their extremely low load factors?

A This business of underground storage has of course become very important in the last several years. If I may be permitted to review it briefly. The first storage field, I believe, was at Zoar in the southeastern New York State, not far from Buffalo. It was a field where the storage capacity was not great but the permeability was great and that had a beautiful capacity to not only produce in the winter but to receive gas in the summer. Apparently it was a rather ideal storage field for these reasons. First, it was close to Buffalo. Second, it did not take too much gas to fill it. Third, it took gas easily. In the fourth place, it gave it up easily. That, to my way of seeing it, is an ideal storage field. In California there is an ideal storage field, possibly the most beautiful of all. The Goleta Field. That field has a capacity to produce from the wells presently drilled more than 200 million feet a

day into the lines that feed Los Angeles. Gas is stored there, of course, in the summer and put out in the winter and the Goleta storage field is what makes it possible for the Los Angeles Gas Companies, Southern California Gas principally and Southern Counties Gas to meet winter requirements.

(Go to page 191.)

A I know of no more beautiful field than that. Generally, the storage fields are selected as close to the market as they can be found, a lot of them in the neighbourhood of Pittsburgh, in Ohio not far from Cleveland; in Kansas City Service Gas Company has them as close as they can get to Kansas City; in Oklahoma the Oklahoma Natural Gas Company search for fields not too far from Tulsa. And the question is, you are interested in Alberta. Well, at this time Edmonton is only 80 or 90 miles from the field that is delivering its gas, and when Leduc becomes more important as a source of gas, that distance is even very much less. I do not know, sir, whether you are thinking of the time when possibly gas might be brought 200 miles and dumped into a storage field close to Edmonton or just what it is you have in mind, but in any case I do not see that the Northwestern Utilities has any present need for a storage field unless it be that Leduc oil well gas comes forth in a stream in the summer time greater than they can handle in their utility operation and require a place to put it, in which case I think Kinsella could be used for that purpose.

Now, when you come to the Canadian Western, I was around here back in 1930 or 1931 when the plans were discussed as to whether or not to endeavour to make of Bow Island a storage field. I think that one of the principal concerns in the minds of the management, I think it was my principal concern, seeing that enormous volume of gas going in the air at Turner Valley, we thought of putting some of it in the ground

as sort of a saving gesture. It turned out to be much more important, not for the quantity of gas that has been put in the ground but for the deliverability that we get down there during these present winters. It turned out to be very important, and as you know, it is 160 miles from Calgary. But on the other hand, it is a very much shorter distance from the cities on the south end of the Canadian Western system. I think that storage is important to Canadian Western Company as the system is now existent. I think that it is well to maintain gas at Bow Island, not let that gas be used up, and if necessary get the gas when we can no longer get it as we are now getting it out from Turner Valley in the summer. I should like to see that gas brought there from some other source unless the other source took the place of Bow Island.

I would like to say one more thing, just to make this point completely clear. The pipe lines built or building to New York City proposed for New England, one of the great concerns is the lack of underground storage for those systems. I have been engaged in studies of that kind for two of those pipe line companies trying to work out the economics of acquiring storage rights on the nearest field in Pennsylvania. Building a line really a long distance, that does not work out, the economics is not good, but the importance of it is widely recognized. That is all.

Q DR. GOVIER: Mr. Davis, some time ago it was suggested to the Board that the day may come when the Turner Valley field may be useful as a storage field

for gas coming from other fields, possibly Jumping Pound and Pincher Creek. Would you care to comment on that?

A Turner Valley has these possible advantages for such a program, not too far from Calgary. What is it, 35 miles, something like that?

MR. C.E. SMITH: Closer to 40.

A Or 40. And then the wells are existent, the gathering system is existent, the compressor station is existent, everything is there ready for such an operation. Now, the thing that is not good, the storage reservoir is too large for good economy in this sort of operation. It would take an enormous amount of gas to raise the pressures, oh, say - - I think that when we withdraw 10 billion cubic feet of gas from the gas cap the pressures go down about 8 or 10 pounds. If we put 10 billion in there from some distant field I would expect the pressures on the average to go up about 10 pounds, and that does not add very much to deliverability. A field is ideal that has a substantial raise in pressure during the period of gas injection. That means that the permeability is great, the gas will flow easy, it is easy to put the gas in and it comes out quickly when you want it. Turner Valley, according to my ideas, is an awfully large field to consider for storage of gas that has to be first purchased, second, transported,and put into the ground. I think it is all right to put the waste gas in there from the oil fields. You do not have to buy it, or if you do have to buy it it is not at a price that would be required for gas from such a field as Pincher Creek. That is my conception.

Ralph E. Davis,
Exam. by Dr. Govier.

I would rather see gas come into Turner Valley than see it go into the air, but I do not think it would ever be particularly attractive to be putting gas in there from the two fields you have mentioned.

Q Dr. GOVIER: My last question, Mr. Davis, was whether you might be able to make available to the Board a back-pressure graph which represented a typical or average well in the Viking-Kinsella field. My understanding of the one that is in as Exhibit J-2 is that that is for Kinsella No. 30, which I believe is one of the better wells.

A It is better than the average well. Yes, I discussed that matter yesterday afternoon with the engineers of the Canadian Western Company and such an average graph is in preparation and will be furnished to you.

Q Thanks very much. Mr. Davis, I did have one other question. I have just had an opportunity to look at Exhibit J-4, which is your set of charts. I notice the abcissa are not labelled . Just so I understand these, would you give me the labels?

A Yes. I must explain to you that those are photostats. Are they photostats?

Q Yes.

A Photostats of my working graphs. They had not been labelled up for presentation to anybody. I hurriedly had a few sets run off. Now, the horizontal space from 0 to 100 expresses the total gas initially in the reservoir in percentage. In other words, the last vertical line at the right is 100% of all gas in this reservoir.

Q Original gas in place?

A Yes.

Q According to best estimates?

A That is right. Now, the vertical spaces represent the quantity of gas taken out annually, which one of these little round circles is an annual production figure, expresses a percentage of the total gas in place.

Q Initially? As a percentage of the initial?

A Yes, sir, of the initial. So if you have a field wilh 100 billion feet initial gas in place, and if you find on my graph there a round circle so spaced on the paper that it is on a line 10, that means that in that particular year 10 billion feet of gas were taken from the field.

Q That is fine. Thank you.

Q MR. STEER: I think you told us that you undertook to supply some further back-pressure data?

A Yes.

Q And will you look at that document and let me know whether that is what you want to furnish to the Board?

A Yes. I would like to say that the 36 graphs of which you have copies were the working graphs from which averages were determined and then graphs representing the average of those fields were made, and the final period of decline is portrayed in those average graphs. This happens to be for 24 fields on the Gulf Coast and the second graphs 12 fields in the fields scattered about the country, some in California, Michigan, and so forth. With each graph there is a list of the fields giving their location,

giving certain data regarding their production, and likewise for the 24 fields, tne list of the fields is given here.

Q DR. GOVIER: Does it indicate whether the fields are sands or limestones? Is there a descriptive comment concerning them?

A No, I am sorry. That is not given here. This is a pretty new study.

Q Well, as a matter of fact, we realize that, Mr. Davis, and we appreciate your kindness in making this information available to us.

A I would like to say I have with this material a description of it, a statement of how it was developed, and how I propose that it be used, and that statement begins on page 12 of this, a more complete statement. The whole statement was placed in evidence before the Federal Power Commission about six weeks ago and I have permission of my client, the United Gas Pipe Line Company, to let you have not only those graphs but this description.

MR. STEER: I think now that Mr. Davis has pointed out that the relevant parts are at page 12, the simplest way would be, subject to the Board's approval, to file the whole document.

THE CHAIRMAN: That would be J-10.

BACK-PRESSURE DATA PUT IN AND MARKED EXHIBIT J-10.

MR. S.B. SMITH: I wonder if Mr. Steer can have copies available for distribution?

MR. STEER: I have a few, not very many.

THE WITNESS: Would you please keep one of those. I want to give it to Mr. Daniels.

MR. STEER: I think perhaps we may have to get some of those page 12 and the following pages reproduced if my friends are very anxious to get them. I think that is all, Mr. Davis.

MR. J.E.A. MACLEOD: Mr. Chairman and Gentlemen, in connection with the evidence to be given by my clients, we propose first to call Dr. Beach to discuss the matter of reserves. He will deal with paragraph A. Then we will call Dr. Dodge to deal with the other matters set out in B, C, D and E, and we propose also to call for the purpose of giving some viva voce evidence a Mr. Stadler of Montana Power Company to deal with the assurances that the Board asks for in the paragraph following E in connection with the question of deliverability. In connection with the question of deliverability the Board expects to receive some assurances from the various producers to the effect that given a market they will be prepared to drill a number of wells required to meet the deliverability schedules. We have no written submission in regard to that but we will go further into detail when our own application comes up. I will call Dr. Beach.

Dr. H. H. Beach,
Dir. Ex. by Mr. Macleod.

HUGH HAMILTON BEACH, having been first duly sworn, examined by Mr. Macleod, testified as follows:

Q Dr. Beach, would you be good enough to inform the Board of your professional and educational qualifications, and also what you have done professionally since you graduated?

THE CHAIRMAN: Mr. Macleod, I think this Board recognizes Dr. Beach's qualifications.

Q MR. MACLEOD: Now, Mr. Chairman, I think Dr. Beach's submission is very short and I think perhaps he had better read it. It is only a page or so. Dr. Beach, I understand there is a little error in one of your tables?

A Yes, I would like to comment on that.

Q Sheet 5, Table 1?

A Yes, on Table 1, Sheet 5. That is the last of the Table 1. We detected the error in our estimate of the reserves of Whitelaw and we rectified it only after we had gone to press, and the new figures should be in our submission under the heading "Gross Gas in Place in Billions Measured at 14.4 psia," instead of 3.3, should read 33.3, and gross gas recoverable to an abandonment pressure in billions of cubic feet measured 14.4 psia should read 31.2 rather than 3.0, and the net marketable gas measured at 14.4 psia should then read 29.6 rather than 2.8. That, of course, changes the totals of the columns. In the column of gross gas recoverable in our estimate for the entire Province is 7753.6 billion rather than 7725.4. Correspondingly the last column is corrected from a figure of 6257 to 6283.8.

Q MR. MACLEOD: Now, will you proceed, Dr. Beach?

THE CHAIRMAN: That will be Exhibit J-11. I do not think it is necessary for you to read this, but if there are any parts or any particular items that you wish to draw to the attention of the Board, you can do do.

Q Surely.

ANALYSIS OF THE NATURAL GAS RESERVES BY DR. BEACH, and MARKET REQUIREMENTS AND DELIVERABILITIES BY J. F. DODGE MARKED EXHIBIT J-11.

Q MR. MACLEOD: Will you proceed, Dr. Beach?

A I think we would want to point out particularly in this respect the source of our data, and I might read that part of it.

Table No. 1 presents the information requested by the Board concerning all natural gas occurrences in Alberta mentioned in Report of Hume and Ignatieff, July, 1950.

Table No. 2 deals with the categories (i), (ii) and (iii).

The data upon which this submission is based are derived from the following sources:

(a) Pendant d'Oreille, Manyberries, Smith Coulee and Black Butte fields, from McColl-Frontenac Oil Co.Ltd. and Union Oil Company of California, the discoverers and owners.

(b) The data in regard to Pincher Creek and Jumping Pound, from Mr. J.F.Dodge, who has made an intensive

study of both fields and has had access to the pertinent information of the owners of these fields.

(c) In the case of Viking-Kinsella and Turner Valley fields, from the report of Ralph E. Davis, Consulting Engineer of Northwest Utilities Ltd. and Canadian Western Natural Gas Company Ltd. The acceptance of Mr. Davis' figures is for the purpose of this submission only inasmuch as we understand that they are based upon the latest data available and we agree with Mr.Davis' method of approach.

(d) The balance of the data is derived generally from Dr.Hume's report (1950) and in some instances from Dr. A. W. Nauss' submission to this Board, and in the case of Medicine Hat, from Mr.A. Liesemer, the Engineer for the Board. Helpful information has also been furnished by various operating companies.

Our indebtedness to specific engineers is expressed in the next part of the submission.

Q Dr. Beach, with regard to Table No. 2, perhaps you had better explain that, and the subclassifications there?

A In Table No. 2 we attempted to classify the proven gas reserves into three categories. The first is "Deferred on Account of Requirements for Pressure Maintenance"; secondly, "Within Economic Reach of a Market, Pipeline or Practical Grid System"; and, thirdly, " Beyond Economic Reach of a Market, Pipeline or Practical Grid System." In the second item we have attempted a further breakdown by using the letter "L" to indicate that such reserves are committed to local use.

Q Dr. Beach, have you given any consideration to the use of Turner Valley as a storage reservoir?

A The detailed study that I have given to Turner Valley was some eight years ago in association with Dr. Hume. We made extensive models of the field, studied a great number of the wells in detail, that is, looked them over in detail and studied it pretty fully with regard to being a reservoir. Mr. Dodge and I had the occasion to discuss the field in generalities regarding that possibility of it being used ultimately for storage. That did not lead to a considered study, but I expresssd the opinion at that time that inasmuch as the gas cap is not one entire extensive reservoir but is interrupted by faulting of a thrust fault nature, to me it seems possible, and I think it would be a practical form of study to consider that some of the fault blocks may in themselves present separate reservoirs, but if the entire field is regarded as too extensive to form a practical reservoir, at least these fault blocks may have sufficient independent closure in their own right to constitute practical reservoirs.

Q Do you want to say anything, Dr. Beach, about your study of the Pakowki Lake areas, which is your own work, I understand?

A I think it would be of interest to the Board. It is generally known that we have recently completed two additional wells in that area, one in the Smith Coulee field and one in the Manyberries field. Both have indicated production in the Bow Island sand and,as such, have augmented the reserves of those two fields accordingly.

And if it is of interest to the Board, I have the figures available indicating what increases we have found as a result. We have found that in the case of Pendant d'Oreille, our previous estimate had been 296 billion, today we regard Pendant d'Oreille as having 308 billion. I speak of the lands and the gas reserves under those lands held by McColl-Frontenac and Union. In the Manyberries field the additional drilling hss raised the gross reserves in place from 55.2 billion to 117 billion. At Smith Coulee the additional well has raised the gross reserves in place from 7 billion to 22 billion.

Q Yes?

A The effect of these figures is to increase our estimate of the total marketable reserves in the Pendant d'Oreille area from 334 billion in our application, as indicated in our application, to our present figure of 406 billion, which represents an increase in the marketable reserves of 71 billion cubic feet, 71.3 billion cubic feet in that area.

Q MR. McDONALD: Were those changes taken into account in your Table 1?

A That is right, Mr. McDonald.

Q MR.MACLEOD: Is that a fact? I mean, does the Table 1 show the original figures or the increased figures?

A The increased figures. The comparison I am making is between our application which was previously presented to the Board.

Q This shows the final figures?

A That is right.

Q Reflects the increase shown by the additional drilling?

A Yes.

MR. C. E. SMITH: And that probably eliminates about anything I have to ask him.

Q THE CHAIRMAN: Would you be able to furnish the Board, Dr. Beach, with the details of how those increases were calculated between the various sands in the Pendant d'Oreille area?

A Surely, I would be pleased to do that, sir.

Q MR. MACLEOD: I did not get what the Chairman asked, but would you tell us about the different sands in these areas?

A The number in Pakowki Lake, speaking generally, as is generally known the Bow Island sand series is regarded as a series of lenticular sands deposited under marine environment. They are generally fine grained and uniform over extensive areas. They are, apparently, lenticular in form and correlated over extensive areas, and the wider the area the less reliable the correlation. We have found, or the sands that have been indicated are "A", "B", "C", "D" and "E" sands in the Pendant d'Oreille field, of which the "A" sand is the thickest, the best developed and the most extensive. We have been concerned with the question of whether or not the sand at Smith Coulee actually correlates and is itself extensive or continuous with the sand of the Pendant d'Oreille field. Our engineers have given considerable consideration to this problem, and the consensus is that these sands do not exactly correlate and, as such, we are justified in regarding the Smith Coulee field as distinct from the

Pendant d'Oreille field. If there is any correlation at all, it would be that the bottom of one sand may be continuous with the top of the other. Correspondingly, Manyberries, being quite remote from the Pendant d'Oreille field, correlation is suggested, but inasmuch as the Pendant d'Oreille field has a distinct water line in its major producing sand - pardon me, - we do not regard these sands as being correlated, but, rather, that they represent separate lenses. In the Manyberries field we find that the distribution of the one sand lying over another is not in a uniform pattern, but it is rather like taking two boards and orientating them at different angles, one to the other. And these factors are taken into our consideration in trying to reach an intelligent prognosis of the reserves.

Q Would you answer any questions, Dr. Beach?

MR. C. E. SMITH: I have two or three of them, if these other gentlemen haven't any.

MR. STEER: Mr.Chairman, I haven't had an opportunity of going through this document. I only received it last night. I haven't had a chance to go through it with my client, consequently, I am not in a position to cross-examine Dr. Beach.

MR. C.E. SMITH: The rest of us got it Monday.

THE CHAIRMAN: Perhaps Dr. Beach will be made available Mr. Macleod, if Mr.Steer wants to cross-examine him later?

MR.MACLEOD: Surely.

THE CHAIRMAN: Does anyone else want to cross-examine, and if they do they can do so now?

.....

CROSS-EXAMINATION BY MR. MARTLAND:

Q Dr. Beach, do you know how the natural gas of what I am going to call generally the Pakowki Lake area is owned? Has the McColl-Frontenac and Union a freehold title or is it a matter of leasing?

A I would prefer not to comment on that phase of it. If you would care to have testimony in that respect, we can arrange it.

Q You would sooner leave it to somebody else?

A Yes.

Q I gather from your application that there has been an outright conditional sale of all the gas in that area to the Montana company, do you know that?

A I have my ideas on that point, but they may not necessarily coincide with the feelings of the Company. I would prefer that they suggest a witness to comment on that question.

Q Anyway, the application is not for a limited period, but it is for all the gas in the Pakowki Lake area?

MR.MACLEOD: That has been amended, Mr. Martland, to be 25 years.

MR. MARTLAND: Is there a supplementary one?

MR.MACLEOD: Yes.

MR.MARTLAND: I have the original one.

Q Do you know anything about the existence of natural gas in Montana, Dr. Beach?

A Not through study. My knowledge is purely from generalities.

Q There are natural gas fields there which are presently serving these Montana companies?

A I believe that is true.

Q And if there were an export line built from the Pakowki Lake area into Montana, can you tell us what Alberta communities would be served by that line?

A In the application to the Board, we analyzed the population density in the area using the figures of one of the recognized census divisions of the Province.

Q Yes?

A I believe it is Cencus Division No. 1 of the Province. There is very low population density there. Over approximately 50% of it is concentrated in a few centres of urban population such as Medicine Hat and Taber. And within the general region wherein lie the Pakowki Lake gas fields, and from there south to the border, the population density would probably not exceed 1 per township, and, as such, the requirements of the few individuals in that area, to my way of thinking, does not present a serious drain on existing or hoped for reserves.

Q The fact would be that the export line would not be to provide any natural gas to additional people in Alberta or Canada, but would be to carry all of the natural gas from that area for consumption in the United States?

A In a practical sense that might be true, but that may not be the flavour or the spirit within which we might contemplace exporting gas to the United States. If there was a sufficient indicated demand along the line, and we were requested to provide such gas, and it would be economically feasible to do so, - I am giving a personal opinion in this respect, - I see no reason why we should not acquiesce to such request.

Q So that your personal view would be that if possible it

would be more satisfactory to provide to Canadians?

A May I have your question again,Mr. Martland?

Q I say, your personal view is, if it is possible to do so, it would be more satisfactory to make this gas available to Canadians?

MR.MACLEOD: I would not say that.

A If there was a large demand, a very large demand,within that area, unquestionably our thinking on this matter would change quite radically, but at the present stage of the population density in that area I cannot see how we can have any interest in it.

Q You are limiting your thinking to the demands within that immediate area?

A Yes.

Q With regard to the practical aspect of it, that line would be to take the gas almost entirely for American consumption?

A Yes, that is the suggestion of our application.

Q Yes, thank you.

.....

CROSS-EXAMINATION BY MR. C. E. SMITH:

Q I suppose it would he also a useful use of gas, wouldn't it, Dr. Beach?

A Yes.

Q You would agree with me there?

A Yes, I would agree with you there.

Q Were there any other counsel wished to ask any questions? I wonder, Dr. Beach, if you will look at what you read on page 2, and paragraph, or sub-paragraph (c) on that page: "The data upon which this submission is based are derived

from the following sources:

(c) Viking-Kinsella and Turner Valley fields, from the report of Ralph E.Davis, Consulting Engineer of Northwest Utilities Limited and Canadian Western Natural Gas Company Limited. The acceptance of Mr. Davis' figures is for the purpose of this submission only."

I just could not figure out what is meant by that. Can you explain that a little to us? You say, "It is for the purpose of this submission only." Is there any explanation of that?

A I can explain that. We prepared this report under very short notice. There was only a month given, and as a result we had not the opportunity to gather the great mass of technical data necessary to make independent studies of these fields. In some cases where we found wide divergencies amongst the various persons who contributed reserve figures, we have attempted to reach an unbiased figure, or a figure that is satisfactory to our thinking, but we recognized in the case of Viking-Kinsella and Turner Valley fields that within the time range it would be absolutely impossible to make the type of study necessary to arrive at an independent figure.

(Go to page 209).

And then in order to satisfy the Board's requirements decided what we felt was the most reliable and available figure on the subject and that is included in our table.

Q Now what I am getting at is, does this mean that you have got something in the back of your mind where at some future date you want to disagree with these figures?

A I think we reserve the right to do that if we make an independent study, to be entitled to our own opinion on the matter.

Q What I want to do is to assist the Board. At the present time you mean your position is yes, we will accept these figures because we understand them?

A Yes, for the reason given that we believe we are in agreement with Mr. Davis' method of approach and we regard him as a man competent to make such a study, and we also believe his data are the latest available.

Q I am not being critical at all.

A I know that, sir.

Q Sometimes I have heard that expression used in court rooms, "For the purpose of this argument only" and the other purposes are about 90% stronger than that. However, we will just take what you have said about this and let it go at that?

A I think we reserve the right, if at some future time we should study it ourselves, we can do so, but at the present time we accept their figures.

Q And beyond that have you anything more to tell me?

A No.

Q Going down to (d) on the same page.

"The balance of the data is derived generally from Dr. Hume's report (1950) and in some instances from Dr. A. W. Nauss' submission to this Board, and in the case of Medicine Hat from Mr. A. Liesemer, the engineer for the Board."

With regard to Hume and Nauss is there any general method that you applied as to which of those two gentlemen's data you would take or accept or have provided for us here? You understand what I mean?

A Yes.

Q Taking a look at Nauss and Hume, they are not the same in connection with many fields. Some are higher than others and some differ considerably?

A The reason for the differentials are tangible and some are intangible. We have attempted to get the basic data on sand electrologs and we can check these figures in one or two factors, such as gas reserves and that is the thickness and the areal extent of the pay zones. We have that information and then we compare Hume's estimates and Nauss' estimates and between the two decide which we feel represents our own view. We also in the intangible sense know each has certain specialties in the line of geology in Alberta, and we assume that one has more detailed geological information to his background to make these reserves than another. We have attempted and we think we are in a position of making a decision on that.

Q So that in addition to the data from Hume and Nauss you have used some information, I take it, you got from

individual companies who have been operating in the fields?

A That is right. Also you may know we keep very extensive files of geological information in our own company for our exploratory purposes. We have made electrologs of our own fields to help us arrive at an independent figure.

Q Would it be fair to say you have used Nauss' figures and Hume's figures, plus your own, and plus information you got from operating companies?

A That would be right.

Q Those four things you have taken into consideration in the preparation of your table?

A Yes.

Q In other words, if I go over your table and take a look at Hume with respect to a field and take a look at Nauss with respect to a field, I find out in some cases you have agreed almost identically with Hume or in another case with Nauss, that does not mean you have taken a high one here and a low one there for your clients' convenience?

A No, the design throughout was to get a pattern.

Q Looking at it as I did somebody might have got the impression that you used the figure that best suited your clients' interests, and that you studied your own comfort?

A No, in certain data we have used certain factors for one and other factors regarding the same field from another and arrived at a conclusion ourselves.

Q In some cases you have used practically in toto the figures of one or the other?

A Yes.

Q And in other cases you have not used in toto one man's figure or the other?

A Yes.

Q And in those cases it is from information you got from operating companies or your own information?

A Yes.

Q On top of table 1 you have: "Proven reserves of natural gas as of October 30, 1950." When you use the word "proven" do you include what Hume used as probable also?

A Yes, proven and probable.

Q And in those items referred to by Hume as "probables" yet you have it in your "proven" table?

A Before the Dinning Commission I believe it was pointed out that he combined them.

Q And is that the reason you have done it, or because of your own opinion with respect to the various figures?

A We believe that the word "proven" is justifiable and that the gas that is indicated as marketable gas could reasonable be expected to be found and to be marketed.

Q In any event, generally speaking this is true that where Hume has said "probable" you have put it in your "proven" tables?

A I am sorry?

Q I say where Hume on occasion has described a so-called reserve as "probable" you have included it in this table as "proven"?

A I believe that is correct, sir, yes. I may want to check further on that but I think that is correct.

Q I do not want to tie you down to anything?

A That was certainly our intention.

Q Now just with reference to one or two items, and not many. Take table 1, sheet 1 first, and your reference to Bow Island. There is no reservoir pressure given. Have you anything that could be filled in in that blank space there?

A I believe in that case the data, the ultimate figures are derived from an area-volume method.

Q In any event you have not any figure to assist the Board?

A Not in that respect, no, sir.

Q Go to the gross gas in place, Bow Island still, where you have 20. I think that is practically the same as Nauss and Hume, very close anyway. Your marketable recoverable is 9, whereas I think Nauss gave 17, for instance. Can you help me or explain how you have about half as much marketable recoverable as Dr. Nauss got with the same gas in place practically? I am trying to help these people trying to get more gas?

A Surely, yes. That net marketable gas we considered in that figure is that gas which is considered to be left in the reservoir and does not take into account the gas that has been put into that reservoir for storage. It is the gas we presumed that remains there - -

Q Your 9 does not represent what you would get out of the Bow Island storage field at all?

A It does not relate in any sense to the recovery of gas that has been stored in Bow Island. It is considered entirely as the original gas, that gas that has not been brought out of the ground from some other point and stored in Bow Island.

Q If you consider what has been stored you would add about 13 billion to your 9?

A Whatever the storage capacity is.

Q If I recall, somebody said that, more or less.

A This gas we speak of will not be available as gas on any contract until the stored gas has been used.

Q Your 9 represents what you think you might get out of it aside from the stored gas?

A Yes.

Q Looking at Castor on page 2. I realize that is in your category of beyond economic reach in table 2, but there is one question there, in your geological formation you say Lower Cretaceous A sand and B sand. I think Dr. Nauss described what I suppose is the A sand as the Viking. Is there any explanation with respect to that, Dr. Beach?

A I cannot comment on that at the moment, Mr. Smith.

MR. MACLEOD: Dr. Beach, you have a chart in the first place. You might tell what the chart is and that might help in this questionning. Before table 1 you have a chart in your submission?

MR. C. E. SMITH: It is not of any great significance probably. I just wanted to ascertain if that were so.

A I think that question, the question is more academic than real in the sense that there has been considerable debate at times of where the top of the Lower Cretaceous actually is. It is based on a study of fossil formations and other things, and from a practical view to call the sands in the lower part of the Colorado Viking or your synonymous names,

Bow Island or Appalachian, whereas the sands lower down were defined as Lower Cretaceous and whereas, as a strict fact, Bow Island itself may be in the Lower Cretaceous, that is by no means the deciding factor but from a practical standpoint to distinguish the various horizons capable of producing gas we realize these isolated sand lenses within the thickness of the Colorado shale as being in the Bow Island group and the underlying dominantly sandy series as being Lower Cretaceous. In the case of Castor, I would have to go and look at the electrolog - -

Q I can simplify this, Doctor. You will probably remember Dr. Nauss referred to this sand in the Castor field as the Viking sand. In other words, that was possibly your A sand?

A Yes, I think I recall that question, that we discussed it. It was our impression that was an error and that probably Dr. Nauss would agree with us - -

Q You are referring to the same thing when you say A sand?

A Yes, it is the same sand.

Q As when he says Viking?

A When he says Viking.

Q O.K. that is all I want. If you look at the Excelsior, probably this is along the same lines. There you have two formations known as Viking in which you have nothing, and Lower Cretaceous in which you have a marketable recovery of 45.6. Dr. Nauss just deals with the Viking and comes out with 36 as his end point. Is there any explanation of that you can give now? It may be along the line you have just explained.

A We made our estimates based on Hume's data. But it was

an independent estimate to arrive at these figures through an attempt to study at least some of the electrologs of that area. We find that the Viking sand was a spotted condition, a little difficult to distinguish on the electrolog and it is our feeling that the sand that is potentially gas productive at Excelsior is part of the Lower Cretaceous series as I defined it a few minutes ago, and that Viking is probably not the proper word for the sand that I am sure both of us are speaking about.

Q Where you refer to the Lower Cretaceous you feel that is the same thing Dr. Nauss refers to in his table with respect to Excelsior when he calls it the Viking sand?

A I am inclined to think so, yes.

Q And then he comes up with 36 and you come up with 45?

A There is a general similarity there. We made our study there upon more wells drilled than there were at the time Dr. Nauss made his study. A comparison of the figures suggests that we are thinking about the same sand.

Q I am glad you mentioned that. Probably your eventual marketable recoverable being higher is because of the information on wells drilled after he prepared his statement?

A Yes.

Q Jumping Pound. I take it there you took Dr. Nauss' figure throughout. Is that right?

A Mr. Dodge is making himself available to the Commission later on, to this Board of Inquiry, and he is in a much better position to comment on our analysis of Jumping Pound.

Q I suppose a question with respect to the thickness,

having regard to Mr. Davis' testimony yesterday of 120 feet and your 147 feet, that should be addressed to Dr. Dodge, is that correct?

A Unless you would like my own feelings in the matter.

Q I am here trying to get information and we certainly would like to hear your opinion?

A The 147 feet, it is my understanding, represents what the Shell Company decided that the pay thickness was and it was based on, as I understand it, a combination of a simple investigation, drilling time breaks, on the general principles that porous formations drill out at different speeds than hard formations and as such are hard to distinguish. The cores taken from these wells have been very poor and as a result the core data gives little information about the porosity conditions. But this combination of intangibles, the 147 feet struck us as reasonable and we were prepared to accept these Shell figures in that respect.

Q When you say "we", do you mean Dr. Dodge and yourself?

A Yes, we have discussed it and attempted to gather some factual data regarding it.

Q Now referring to Leduc-Woodbend on sheet 3. I think I have already covered that. But what I am coming to, Doctor, is, as I recollect, Hume describes particularly the Lower Cretaceous as "probable" and you have it in as part of your table?

A Yes.

Q You would not like to change the category of that, would

you, Dr. Beach, in your own opinion, let alone Hume's?

A Change it from what?

Q Have you put it in here because Hume described it as probable or because you yourself think it should be taken as proven, this Lower Cretaceous 155 in place, for instance?

A We regard that as gas that can be recovered. It is an independent horizon, quite distinct from the oil production portion of the field. It is a gas field by coincidence overlying an oil field, as we look at it.

Q You are quite content to leave it in there as proven and have that as your opinion before the Board?

A Yes.

Q With regard to Manyberries, you have already explained that, I think, that the difference between the figures in the original submission and the figures you now have in this table are due to information you have secured by the drilling - -

A - - the drilling of two additional wells.

Q Since the first application?

A Yes, that is right. They were being drilled, I think, at the time we submitted our application.

Q And that, to save me time later, applies to the Pendant d'Oreille and the Smith Coulee field as well?

A It has given certain factual data that we are going to supply on which we revised our estimates.

Q Now with respect to Morinville-Calahoo, I notice that you have in your gross gas in place 306 billion. You remember Dr. Nauss' table, I think he had 872?

A Yes.

Q 872 billion. Can you help us in any way by giving us some idea why the two of you are so far apart here?

A We are very much concerned about that. We realized the percentage suggested by Dr. Nauss represented a very appreciable percentage of the total reserves of the Province. We were concerned about it. We have gone over the electrologs and have arrived at our own determination of the thickness. But the most potent factor in causing the variation is in the area, the area that one would assign to the Morinville-Calahoo area. I think you will notice that our gross reserves lie somewhere between Dr. Hume's estimate and Nauss' estimate.

Q I noticed that and that was one of the things where I could not quite follow you as accepting either one of them?

A Independently we plotted the data and a study of this nature of the Morinville, it is not fair to the problem just to study the wells, the three wells or four wells that are concerned immediately with the problem. But in order to determine the general character of the sedimentation in that area it is better to make careful study and once having made a study of the sand occurrences to attempt to project that into the future, but by consulting, however, the specific information you have. We arrived at our interpretation of that to be assigned to Morinville through one of these studies. It is not the study of a minute, it is a study that has gone on for a considerable length of time. We do not accept that area that

Dr. Nauss has assigned to it. I do not have his area here.

Q 139,000 and you have 14,000?

A That was controlled partly by the dry holes in the area. But dry holes, even if they are dry, may have sand in them which at least indicates the potentiality that the sand, although dry at that location, may expand to something fruitful further away. But for our information, the dry holes must be taken as productive wells. What I am getting at is instead of making a triangle and with bulging sides we have tended to bulge the sides in a little bit as affording a more modest interpretation of the area.

Q In other words, as has been said before in discussions before the Board, you would like to see a great number more wells drilled before you come to a very definite conclusion about this situation?

A Yes, that is an obvious conclusion. I think it is a very fruitful place to explore.

Q Still with respect to that question of the amount recoverable, I think it basically depends on the question of the acreage taken in an area from which you arrive at your total, is that correct?

A That is a large factor, yes. That and to a minor extent thickness.

Q Which is just the same, is it not, 40 and 40?

A That was my impression, that it varied by a little bit. I do not have Dr. Nauss's figure.

Q I have it here. He gives it as 40.

A And we have 40.

Q You have 40 too? However - -

A THE CHAIRMAN: I think we might recess.

(At this stage there was a short adjournment.)

(Go to page 222.)

Q For the benefit of the Court reporter I will just be a minute or two, and I was asked to go into the prisoner's box, but would you do your best to sort of face off in that direction, Doctor?

A All right.

Q Would you look at Picardville on your table, the last item, and referring to gross gas in place, the figure of 43 billion. I am wondering whether or not you checked your table since it was printed or mimeographed or typewritten. I am just wondering if your figures bring you to 43. I did not check it but I asked somebody who knows something about it to do so.

A The source of our data in that respect are from Union Oil Company who drilled that well.

Q You mean, you just accepted their figures?

A We accepted their figures as being the most reliable.

Q Would you work it back. It would only take a few minutes to work it out.

A I have the basic data but it would take some time.

Q Would you mind checking that after you get down and if there is a correction would you let us know?

A I would be pleased to.

Q With respect to Princess, just one question there. You refer to Bow Island and I take it that is what Dr. Nauss refers to as Basal Alberta. Is that correct or do you know?

A The Bow Island is a sand, is very poorly and spottily developed in the Princess area but an underlying source of sands that are not present extensively over Alberta

do have a very appreciable development in the Princess area. The term that we are giving as Bow Island, we have in mind actually sands that lie a little below the typical Bow Island horizon and yet above what we would normally call the Lower Cretaceous.

Q All I wanted you to do, would you look at Dr. Nauss's table there. I think you have it in front of you. Princess is about two-thirds of the way down the page?

A Oh, yes.

Q I notice he has Basal, whatever you call it, Alberta sand and his data is practically the same as yours?

A For the Bow Island.

Q Opposite Bow Island?

A We both refer to the same sand. We are wrong, actually, in calling it Bow Island, we should have called it Basal Alberta sand. It is a little below the Bow Island.

Q And you have two more, Lower Cretaceous and Devonian, and he only refers to Lower Cretaceous?

A Yes, sir.

Q Calls it Lower Cretaceous Sunburst. Is there a combination there?

A The Sunburst is a local name for sand at the base of Lower Cretaceous. It is called Sunburst because it is a very poor quartz sand, very similar to a sand at the same position in the section in Montana, and the name has been brought into this country.

Q If I understand it correctly, you have added Devonian to what he has in his text?

A Yes, sir. We believe that there is some gas in connection

with the oil production in the Devonian. Evidently Dr. Nauss did not consider it.

Q Well, if you are correct, there is quite a lot of marketable recovery, up to 68 billion?

A Yes, sir, but it is a wet gas.

Q That is from information you secured other than from Dr. Nauss or Dr. Hume, is it?

A In that case that came from both Hume and Nauss, that information, and in consultation with the California Company too.

Q Even though Nauss did not refer to it in his table?

A It would be overall. Our overall data regarding Princess has come from four sources.

Q I am speaking of Devonian?

A The Devonian, our information, as I recall, is partially from Hume and partially from the data from the California Company.

Q Now, would you look at Redwater, Dr. Beach. Seeing you refer to Dr. Hume's report so often, do you have it there in front of you, by the way?

A Yes, I have a copy, sir.

Q I take it it is intended by you as well as everybody else that the Board is able to look at this, although it does not seem to be put in by anybody. You have no objection to the Board seeing Dr. Hume's report, I hope, even though it is not an exhibit in this Hearing?

A No, none whatsoever.

Q Take a look at page 8?

A Page 8 of Dr. Hume's report?

Q Yes. In the last part of the top paragraph there you notice the line beginning, "In Redwater and Golden Spike.....", the sentence beginning with that. Have you found the place, Doctor?

A I think so, "In the Redwater and Golden Spike fields..."?

Q "In the Redwater and Golden Spike fields from the producing Devonian beds the gas oil ratios of the solution gas are too low to provide excess gas for commercial use and most of the gas will be burnt in flares. This gas, therefore, although it is included in the appraisal, is not a reserve that will be used after it has served its purpose in producing oil."

Having regard to that statement and having regard to your figures of 14.2 and 109 billion marketable recoverable, would you care to comment at all?

A I am not a petroleum engineer, Mr. Smith, and I do not believe my comments would be helpful to the Board.

Q Do you understand what I am getting at?

A Yes, I do, but I think there is a technical question involved that I would not care to comment upon.

Q Well, I am far removed from even your profession or Dr. Hume's or anybody else's. Do I take it as a layman that he says that won't be marketable usable, and yet you have put 120 odd billion in under your column of marketable usable?

A 109.

Q 109, yes?

A Of marketable.

Q THE CHAIRMAN: You have that in your table too, Dr. Beach, as being within economic reach of market pipe line or practical grid system?

A That is right.

Q MR. C.E. SMITH: But you can see the significance of what I am getting at?

A Yes. I am sorry but I can not comment on the technicalities of it.

Q Maybe Dr. Dodge can?

A Surely. He may be able to comment on that point.

Q Now, I think just one other with regard to Smith Coulee and the difference between this and your application. I think that is all I have, Doctor, thank you.

Q THE CHAIRMAN: Will you just figure out that Picardville computation and let us know?

A Yes, I shall.

MR. C.E. SMITH: It will undoubtedly affect your last column too.

Q MR. MACLEOD: Just a moment, Dr. Beach. There should be another correction carried into that Table 2. It is the same figure that we corrected.

A Whitelaw?

Q Yes, instead of 2.8 it should be 29.6?

A Yes.

Q Sheet 2 of Table 2?

A Yes, on Table 2, Sheet 2, under the term "Whitelaw" in column 3, 2.8 should read 29.6. I think that is correct.

MR. C.E. SMITH: Has anybody added the total there now? Well, I can do that.

Q MR. MACLEOD: What is that, 660.1?

A 660.1.

Q THE CHAIRMAN: Dr. Beach, one question, I am sorry. Would you mind coming back?

A Surely.

Q I do not want to labour this point of proven and probable reserves, but in Dr. Hume's report, which you have used extensively, he has, as Mr. Smith pointed out, separated his reserves into proven and probable. In many cases where you used his figures you have used probable, as Mr. Smith pointed out. It would seem to me that in certain cases Dr. Hume, in giving the reserves of the field, went to considerable pains to differentiate between proven and probable. In other words, when he calculated his reserves he in some cases indicated the proportion as between proven and probable. Do you still consider that anything you have in there could be considered in this table as a proven reserve?

A If I interpret Dr. Hume correctly, proven reserves, by his definition, are only those reserves that are now being produced, and in that concept is much more limited than ours. We believe, and I think our concept of proven reserves is in keeping with the United States Courts on gas matters, that if there is a high probability of that gas being made available to market indicated by the data at hand that those can be considered proven reserves, and that is the concept that we have used in setting them up as proven reserves.

Q Well, Dr. Hume only considered proven reserves where a

field is being produced?

A I have not read that section for some time but that is my analysis of it.

Q I think Mr. Smith has a copy of the report. I wonder if you would just mind glancing over the copy.

MR. C.E. SMITH: I hope you observe my name is on this.

THE CHAIRMAN: I think he has a table there of the various fields.

Q MR. C.E. SMITH: Have you found what the Chairman was referring to, Doctor?

A I think my analysis or interpretation of Dr. Hume's distinction between proven and probable reserves are as I stated them, that is, that proven reserves as Dr. Hume visualized it, are only those areas that are actually producing gas at the present time and that there has been extensive drilling and he uses it, contrasts the two, probable and proven, as much on the method of calculation that he uses and the other factor. We still regard our interpretation of the word "proven" as being a reliable method of indicating what we feel the Board wants to know. In other words, the amount of gas that there is a high degree of expectancy of being made available in one way or another to market or could be made available if a market was there, and we would regard our fields down in the Pakowki Lake region as proven reserves. We feel we have done sufficient drilling that it would be almost dumbfounding if our general outline of the field changed markedly or that the expected

gas to be produced from those fields would change in any high degree of percentage than what we have postulated. We would therefore put our fields in the proven class and any of the other fields we have considered have proved up certain amounts of gas.

Q The figures you have given is all proven reserves?

A Yes, sir, in our interpretation of the word, it would be.

JOHN F. DODGE, having been first duly sworn, examined by Mr. Macleod, testified as follows:

Mr. Dodge has been a witness before the Board on the Westcoast application so his qualifications are a matter of record.

THE CHAIRMAN: Yes.

Q MR. MACLEOD: Dr. Dodge, you heard the evidence of Dr. Beach that he had got the figures which he used with regard to Jumping Pound and Pincher Creek from you?

A That is right.

Q And you made an exhaustive study, I think you told us before?

A I did. I made an exhaustive study of the matter of the reserves on Jumping Pound nearly two years ago for the Shell Company, and at their request presented those matters before the Dinning Commission. I later repeated the same testimony before this Board in connection with the Westcoast Transmission Company's hearing when I appeared for them, and so far as I know, there are no additional data available and I have no reason to change

any conclusions which I made at that time. I had available to me at that time not only all of the records of the Shell Company but the assistance of engineers who sat on the wells for the Shell Company, and I believe that I was and am now in full possession of all data which are available in that matter.

Q Perhaps you had better present your submission. I assume, Dr. Dodge, starts reading on page 2. By the way, Mr. Chairman, will we mark this separately?

THE CHAIRMAN: No, as one exhibit.

A If I may read a portion of the introduction to the section on market requirements and deliverability which is contained in this yellow-covered presentation which has already been given an Exhibit number, I believe. The first page of that general statement, I think, does not need to be read other than the first paragraph in which I say,

> "This submission has been prepared in answer to the Board's request, made September 28th, 1950, for information on the gas reserves, deliverability and Provincial requirements to meet the following specific questions."

Then the questions are listed and I see no reason to read those numbers to the top of page 2.

> " Answers to question (a) of the same request have been presented in a separate submission prepared by Dr. Hugh Beach and associates. The writer has collaborated with Dr. Beach in that work and has prepared the estimates presented by

" Dr. Beach for Jumping Pound and Pincher Creek.

This submission consists largely of tables which are generally self-explanatory, but it is felt that certain prefacing remarks may be helpful.

The position of applicants, McColl-Frontenac Oil Co. Ltd. and Union Oil Company of California is somewhat unique in that they are requesting authority to take gas only from their fields in the Pakowki Lake area, somewhat remote from centres of consumption in the Province to supply their export market. The export of gas planned and for which permit is requested is limited to the potential deliverability from applicants' own fields and is to be delivered to the Montana Power Co. to supply an already established market through existing distribution facilities. These studies have, therefore, been directed to the question as to whether ample gas was available to satisfy Provincial needs in proven fields other than those in their area, fields which might be equally or more readily drawn upon to supply those needs. They have, therefore, treated question (b) as more or less dependent upon question (c).

In preparing an answer to question (c), applicants, Union Oil Company of California and McColl-Frontenac Oil Co. Ltd., have adopted for the purpose of this submission the statements presented by Canadian Western Natural Gas. Co. Ltd. and Northwest Utilities Ltd., as to the

"estimated present and future gas requirements of the Province of Alberta, particularly as to the areas presently served by them or which may be reached by their systems. Schedules of these requirements are contained herein as Tables I and II respectively, and in recapitulated form in Table V."

I might explain that the Table numbers in this second submission, we start at a separate submission. In other words, these are not Tables I and II of Dr. Beach's presentation.

" They have similarly adopted for the purposes of this submission, the requirements of the proposed pipe line connection with Montana Power Company's gas system as prepared by the Montana Power Company. These requirements will be found in Table III.

Based upon these requirements, and in answer to question (b), a study has been made of the estimated present and future deliverability of gas from areas under the classification (ii) of question (a), (Commission's request of September 28th, 1950) namely, 'within the economic reach of market, pipe line or practical grid system', other than those dedicated to local use. The results of this study are presented in Table IV.

The choice of the fields to be included in this classification and their subsequent treatment in the estimate, naturally required decisions by the estimator of a somewhat arbitrary nature,

Dr. J. F. Dodge,
Dir. Ex. by Mr. Macleod.

"and it is fully realized by applicants that the analysis herein presented is only one of many possible solutions to the problem. Furthermore, it is realized that the schedule presented may be deviated from in the future as the result of new discoveries, extension of present fields or other factors, geological and economic, impossible at present to visualize or evaluate."

(Go to page 234)

Applicants present the analysis set forth in Table 4 as one entirely feasible solution to the problem presented by the Commission.

It should be noted that with respect to gas from oil fields shown in Tables 4 and 7, estimates have been made based upon future rates of production of oil. It has been assumed that within the next five years, additional oil pipe line outlets will be provided to allow for rates of production commensurate with reserves established. Oil field gas must be conserved and taken as produced, and withdrawals from dry gas fields have been adjusted to meet variations in oil/gas supply and to provide for fluctuations in peak loads.

Item (d) requested a solution to the problem of how the present and future requirements of the Province may be met from existing reserves of gas for at least 30 years. This has been met in Table 6 in condensed form by a showing for the years 1951, 1970 and 1980, but the studies for intermediate years have been made and are omitted here only to avoid burdening the submission with a mass of figures of a repetitive nature. In explaining that, I should say we tested, as we went along, to determine whether or not we are able to meet the deliverability quantities from the fields which we were using in these intermediate years, and rather than present 30 odd tabulations, we have limited it to the presentation of the three periods mentioned. Annual withdrawals by fields for the years 1951 to 1970 and at two-year intervals thereafter through 1980 are shown in Table 7.

Question (e) covering the manner in which applicant proposes to supply the requirements of the pipe line connection to Montana Power Company system, is answered in Tables 8 and 9. Table 8 shows in condensed form the manner in which the export market will be met from existing reserves for the years 1951, 1960 and 1970. Table 9 shows annual withdrawals for the years1951 to 1970 inclusive.

The writer has been assisted in the preparation of this submission by Mr. W. W. German of the Gas Division of Montana Power Company. Mr. German's long experience in natural gas production and transmission work has rendered his assistance invaluable and is gratefully acknowledged.

Q Have you anything further to say, Mr. Dodge?

A I would like to review briefly orally exactly what we did. As mentioned in the written portion of the submission, we accepted these annual market requirements and peak day loads which were furnished us by the local gas companies. We then prepared a table which represented a consolidation of those two tables with respect to the three periods for which we were going to make our studies, namely, Table 5, which presents for the years 1951, 1970 and 1980 the estimated present and future gas requirements of the Province of Alberta. And you will note that there are some notes, one note at least, which might be mentioned, and that is that the towns of St. Paul, Vermilion, Wainwright, Brooks, Redcliff and Medicine Hat are amply supplied for the periods above by local or nearby fields. These towns and fields are not included.

Taking those as an aim or goal to achieve, we then referred to Dr. Beach's reserves as established in his Table 2, and used the fields shown in Table 4 down as far as and including Pincher Creek, as a source of the gas to supply the demands shown in Table 5.

Table 4 also includes the withdrawals, the deliverability from Manyberries, Pendant d'Oreille, Smith Coulee and Black Butte, which I will discuss later in connection with the supply to the Montana Power Company's system.

Having chosen the fields, it is a matter of cut and dry to determine whether or not there was availability. The reserves were there and it was a question of determining whether there was availability. That is shown in condensed form on Table 6 as combined with Table 4. In other words, the amounts which need to be withdrawn, the average day, and the manner in which it was to be supplied is shown on Table 6; and the availability for the corresponding period is depicted upon Table 4. The reason for that somewhat queer arrangement is that we thought that we should stick literally to the arrangements and the questions in the Board's request, and if it appears that we have placed the cart before the horse, in our Tables, it is in an attempt to answer literally and specifically the order of questions which the Board requested. I think there is no other explanation necessary in regard to those Tables.

Table 7, which was originally numbered in error as Table 8, and has been corrected,

in pencil, I believe, in all the copies, shows the amount of gas that we would withdraw each year for a number of years, and then finally by two-year intervals for later years.

I would like to call your attention to one other thing, and that is that on the last page of Table 7, there is one matter which is of interest, I believe, and that the total marketable reserve in fields which are required to supply demand of Canadian Western and Northwestern Utilities' systems, as set up by us, amounts to some 4-7/10 trillion cubic feet. Now, that does not mean that it is necessary to devote all of the gas in all of those fields to supplying this matter, but it does mean that we have to call upon fields containing that much gas in order to get the deliverability which is required at various times within the 30-year period. The accumulated withdrawal of the marketable gas from these fields during the study period, namely, the 30 years following the estimated demand set up by the Gas Company, amounts to 2 trillion, 208 billion, and by subtracting that from the total marketable reserves you will see that there is approximately 2½ trillion cubic feet of gas left in the fields which we have treated. Now, portions of that gas might be withdrawn for other purposes, but the greater portion of it remains there as a backlog to furnish the deliverability which has been required throughout this period.

I might pass now to a similar treatment for the applicant's own market, which they propose to supply from these fields. As I pointed out

before, Table 3 is an estimate of the takings of the line which will deliver gas to the Montana Power Company, which is proposed to do. I believe this will later be substantiated by another witness, and I may say for this purpose we have merely adopted that schedule of takings. The manner in which we proposed to meet those requirements is shown in Table 8, and the withdrawals which will result from those takings is shown on Table 9. That, I think, is in substance what we have done in an attempt to answer specifically the Board's requests.

Q Thank you, Mr. Dodge. Mr.Dodge is now available for cross-examination.

MR,MAHAFFY: Mr.Chairman, was this document given a specific number?

THE CHAIRMAN: Yes, Exhibit J-11.

MR.MAHAFFY: Thank you.

THE CHAIRMAN: Mr. Nolan, do you wish to cross-examine?

MR.NOLAN: Just excuse me a moment.

.....

CROSS-EXAMINATION BY MR.NOLAN:

Q Tell me, please, Mr,Dodge, in Table 7, Sheet 2, that figure at the end of Sheet 2, "The marketable reserves in these fields remaining at end of 1980" of 2 trillion something, 2,493.9?

A Billions.

Q Billions?

A Yes, that would be 2 trillion.

Q 2 trillion, 493 billion?

A I read it, I believe, roughly as 2½ trillion cubic feet.

Q Now, in the event of your not getting an export permit that amount would be increased by your total reserves, would it not?

A By our total marketable reserves, yes, sir.

Q And what would that figure be?

A I think I will have to refer to Dr. Beach's submission for that because I do not think I have it in my figure.

DR. BEACH: 406 billion.

A 406 billion.

Q MR.NOLAN: 406 billion?

A Yes.

Q So that the figure of 2 trillion, 493 billion would be increased by 406 billion?

A Yes, sir.

Q Thank you.

MR.FENERTY: There is one question that I would like to ask.

THE CHAIRMAN: Yes.

MR. FENERTY: And that is because I do not remember statisticz.

.....

CROSS-EXAMINATION BY MR. FENERTY:

Q Dr. Dodge, when you were giving evidence before in connection with another application for export?

A Yes, sir.

Q Do you remember offhand whether all of the areas now referred to in Table 6 on which you say "No export market assumed supplied from above areas", do you remember whether all those areas were allocated to internal markets then?

A Could I have just a moment, Mr. Fenerty, to catch up with this?

Q I don't think it was.

A I do not think any particular areas have been allocated to local requirements.

Q You see what I mean, "No export market assumed supplied from above areas"?

A Yes.

Q Let us use the word "supplied" then we won't get into any difficulties?

A Oh, yes.

Q Your evidence now, when you are talking about deliverability and everything, is on the basis that no export market is supplied from any of these areas. My recollection is when you were on the stand with reference to another export application, that the whole lot of this gas was going to be used for export, isn't that right?

A That is correct, sir. I explained....

Q That is all I wanted to know.

A May I be allowed to explain my answer?

Q Oh, if you want to?

A I think that here we are concerned with a certain specific request or requests of the Board, namely, how we supply the Provincial requirements, how we supply the applicant's lines, and I am not concerned at the moment where anybody else gets his gas.

Q I know, I have been on two sides of a question myself.

A I am not on two sides of the question. I am concerned, what I am concerned with is to assist the Board, as I understand it, in the interpretation of the facts.

Q I am interested and I appreciate what you are doing. I just want to bring it out.

A I think we have brought it out between us.

MR. McDONALD: Mr.Chairman, I would not want the record to contain the inference that Mr.Fenerty is attempting to place on it. I think Mr. Dodge's evidence in his evidence-in-chief was very definite that there remained 2½ trillion cubic feet, that that remained available for export from the fields he mentioned. That is his evidence. That is not the inference Mr.Fenerty is taking from it.

MR.FENERTY: I am not taking any inference from it. Dr. Dodge has been giving evidence on the basis of internal consumption with regard to these other areas, that is all. I thought the Board would like to have that pointed out.

MR. S. B. SMITH: I have some questions.

THE CHAIRMAN: Yes.

.....

CROSS-EXAMINATION BY MR. S. B. SMITH:

Q Mr.Dodge, you are, I take it, familiar with what I understand to be the policy of the Province of Alberta with respect to the export of gas, namely, that such gas as we have should be first available to the people of Alberta, secondly, available to the people of other Provinces of Canada, and, thirdly, available for export to the United States? That may not be an exact expression of the announced policy, but that is what I understand it to be, and you have heard about that?

A I have heard about the first part of it, Mr. Smith. I

believe the second and third clauses in your statement are not in accord with the things I have heard previously. They may be. They may very well be, but they are not in accordance with my understanding of it.

Q Perhaps you will assume that I have accurately expressed what I believe to be the policy of the Province of Alberta?

A Yes.

Q What I have suggested to you is, of course, consistent with subsection 2 of section 7 of The Gas Resources Preservation Act which provides "The Board shall not grant a permit for the removal of any gas from the Province unless such gas in the opinion of the Board is surplus to the present and future needs of the people of Alberta." You are thoroughly familiar with that?

A Yes, sir.

Q Now, you heard Mr.Davis' evidence yesterday?

A I did.

Q You heard it?

A Yes.

Q You were here?

A Yes.

Q I take it that Mr. Davis suggested, quite strongly, I think, I think his evidence is here and I can quote it to you if you like, that the Pakowki Lake country perhaps should be tied into the system of the Canadian Western Natural Gas Company? You heard him advance that suggestion here yesterday?

A I don't think I would come to the same conclusion you did.

Q I am not asking you whether you come to the same conclusion, I think perhaps you wouldn't.

A No, you misunderstand me, Mr. Smith.

Q I see?

A I did not understand him to advance that thesis.

Q Well, let us read what he did say then. I have the transcript here.

A All right.

Q At Page 169: "The Pakowki Lake country, I think, has around 250 billion. It might be possible to plan out a pipe line based on those fields. That might be possible. Personally, if I were responsible up here for the future of a utility company like Canadian Western, I would want to be assured of some gas beyond that which Canadian Western now has. At this moment that might mean some part of the Pincher Creek or Pakowki Lake thing."

That is what he said.

A Yes.

Q Now, it is a matter of interpreting what he said?

A Surely.

Q I suggest that he meant quite possibly that the Canadian Western's system should look to the Pakowki Lake where there is about 250 billion of the 750 additional billion, which he said in his opinion Canadian Western should acquire between now and 1960? He did say that in his report?

A Yes.

Q Now, would you agree with my interpretation? I do not know that it matters.

A I do not think that I would agree with your interpretation or with Mr. Davis' statement.

Q I see. Well, Mr. Davis' statement is here. Now, if my interpretation of Mr. Davis' statement as one of the

possible alternatives suggested by him is correct, that the Pakowki Lake area should be tied into the Canadian Western system to help take care of that 750 additional billion which he said was required, then it would not be very difficult to connect that with the Calgary system? It is not very far away from the end of the line?

A Well, it isn't very far away from the end of the line, but whether or not that line would serve anyuseful purpose in moving additional quantities of gas to Calgary, I have not investigated.

Q I see? It is not very far from Bow Island, in any event?

A No.

Q And Bow Island, you will be free to agree, is a very fine storage field within its limits?

A Yes, it is a very find storage field within its limits, but I think much better ones could be developed.

Q Now, if my premises are correct, that Mr.Davis suggested that perhaps the Pakowki Lake area should be, more or less, dedicated to Calgary, and if it can be made available to Calgary, and assuming that Mr. Davis is correct when he says that Calgary should acquire an additional 750 billion feet in the next ten years, then, I think, on those assumptions, you might say that the Pakowki Lake area....

A Yes.

Q ...on those assumptions should be dedicated, or assumed to be dedicated to the City of Calgary? If my assumptions are correct?

A Oh, if your assumptions are correct, I suppose your conclusion is correct.

Q Then, if my assumptions are correct, and if my conclusion

is correct, what you want to do and what you are advocating is that we take this Pakowki Lake gas, which I suggest possibly should be available to the Canadian Western system, and export it to Montana, that is correct, isn't it?

A That is correct. And I base my conclusion on that because I think that is our best solution to the problem of the local Gas Company's requirements.

Q I understand that, but if my assumptions and my conclusions are correct, then it would seem to follow that the course that you advocate is contrary to subsection 2 of section 7 of The Gas Resources Preservation Act?

A I think that would be a matter for the Board to determine rather than me.

Q Yes, I think it is. But I am suggesting to you that is a very distinct possibility? Or do you prefer not to answer that?

A I prefer not to answer that as I think it is taking in too much territory.

Q Yes. Now, are you familiar with the application of the Company that I represent here, that is, Prairie Pipe Lines?

A I was given an opportunity to read very hastily a transcript, I believe, of several days' hearings in which either your company or an affiliated company was presenting the applicatiom, but I do not believe I have read your application in detail.

Q No. Now,,let me tall you about some of it, whatPrairie Pipe Lines is asking for.

MR. MACLEOD: Isn't it Pacific Pipe Lines?

MR. S. B. SMITH: No.

Q Prairie Pipe Lines Limited, Prairie Transmission Lines Limited, is asking for 100 million cubic feet per day. I am reading from Page 4 of our application, and it proposes to take that amount of gas into the Vancouver, Victoria and Trail section of the market, which you will agree is a Canadian market?

A Yes.

Q And then it goes on to say thatit will take in excess of 100 million feet per day, and if additional reserves justify, an additional 250 million feet per day, and will build a pipe line to the Ontario market, and will, in effect, deliver Alberta gas, or the equivalent, to the Ontario market, again a Canadian market?

A Yes.

Q Well, now, your estimate and Mr. Davis' estimate of the Pakowki Lake area are somewhat apart, aren't they? Mr. Davis' was 250 and yours, I think, is somewhere in excess of that, 406?

A If you are referring to Dr. Beach's estimate in which I concur, I believe there are some very obvious reasons for that.

Q There probably are. There are some developments.

A I think Mr. Davis testified that his reserve as to that was based upon data which was at least a year and a half old. I cannot recall the exact date.

Q Yes?

A And developments have been so rapid in that area that it has been necessary for us to bring our estimates up to date in the last two weeks.

Q Of course, these are all estimates?

A They are, yes.

Q Yes. Now, Dr. Nauss' estimate of the marketable gas in Pincher Creek was 1252, 1 trillion, 252 billion, do you remember that?

A I do not remember the exact figure.

Q Well, you can take my figure, and you can assume it is correct?

A I can tell you the way in which it was determined, and it differs from the figure which I have presented.

Q If you take 250 billion as the marketable gas at Pakowki Lake, and add that to what Dr. Nauss estimated at Pincher Creek, of 1 trillion, 252 billion, and taking the 1 trillion, 252 billion adding it to the 250 billion, that gives you 1 trillion, 502 billion?

A Yes.

Q That will be correct?

A Yes.

Q Now, Mr. Davis said that the Calgary system will require another 750 billion?

A Yes.

Q And Prairie Pipe Lines Limited asks for initially 100 million feet per day from some source in Alberta, which, I believe, works out at something like 730 billion per year?

A No, I think that is your 20-year period.

Q I am sorry, that is the total, that is correct. Over the period of 20 years?

A Yes.

Q So that if you add those two figures together, the 730 and the Calgary requirements of 750, it is 1480 billiom

cubic feet.

A I think your arithmetic is faultless.

Q Which is quite close to the total that Mr. Davis estimated of 250 billion for Pakowki Lake plus Dr. Nauss' estimate for Pincher Creek, that total being 1 trillion 502 billion cubic feet.

A That is correct.

Q And that is without taking any gas into Montana, isn't it?

A Yes.

(Go to Page 249)

Q Yes, and if you take 250 billion into Montana?- -

A Substantially that, yes.

Q What I am suggesting to you is if these figures are approximately correct and you are dealing here still in approximations, aren't you, Dr. Dodge?

A Yes.

Q If these figures are approximately correct, if you take that 250 billion into Montana, conceivably it might have the effect of preventing gas being exported to Vancouver, might it not?

A Conceivably, if we follow your premises. However, I think your premises are completely out because you think of the quantity of gas without giving attention to the matter of deliverability. If you want to deal in just pure arithmetic, tossing billions about here and there, your conclusion is correct.

Q You will agree that there is at least a possibility that by exporting gas to Montana you might be interfering with the furnishing of gas to the City of Vancouver?

A Might I put it this way, and I prefer to put it this way, we might be interfering with the delivery of gas to Vancouver through your proposed system.

Q Yes, and that is what I am talking about?

A But not through any other system, no, sir, which considers other reserves.

Q I am not talking about any other system?

A Your question does not imply that.

Q I believe I started out by referring to the application of Prairie Pipe Lines?

A As long as we understand we are discussing and continuing a thesis dealing with that, but your question does not imply that.

Q I thought it did. But now we have cleared that up and we are both satisfied that that is what we are talking about?

A That is correct.

Q On this premise the delivery of gas to Montana by the company you represent here might prevent the delivery of natural gas from Alberta to the Cities of Vancouver and Victoria?

A Through your system that is correct.

Q According to our plan?

A That is correct.

CROSS-EXAMINATION BY MR. MARTLAND:

Q Have you made any study of the Montana reserves, Mr. Beach?

A No, I have not been asked to do that.

Q There are fields there?

A There are fields there. I understand that situation with reference to Montana and to the market there will be treated by another witness.

Q There are existing pipe lines there which I understand the Montana Power Company intends to extend to serve other customers?

A That is correct.

Q Now the gas in what we call the Pakowki Lake area generally is dry gas?

A Yes.

Q And I refer now to page 4 of your own part of the submission and the first complete sentence at the top of that page?

A Yes, sir.

Q "Oil field gas must be conserved and taken as produced and withdrawals from dry gas fields have been adjusted to meet variations in oil/gas supply and to provide for fluctuations in peak loads."

Am I correct that you visualize the functions of dry gas fields in the over-all provincial scheme as being of considerable assistance in meeting the problem of the disposal of gas produced from oil fields?

A I think that has been my position, as stated before, before this Commission, but not in this hearing, that true conservation involves taking care of first, all of the oil field gas and using the dry gas fields, where your gas can be turned on and off more or less at will, to supplement and complete the meeting of the demands of any market. In drawing up this schedule we have assumed - that is Mr. German and myself, who drew up the schedules - have assumed that as the market for Canadian oil increases and as certain of these oil fields have more gas made available as a result of the increasing gas/oil ratios that inevitably result from a later lowering of pressures, and all the things that enter into that, there will be larger and larger quantities of oil field gas available and this must be taken care of. True conservation requires that you give attention to that and hold in reserve your dry gas fields. And that is the meaning of

that statement.

Q Yes?

A That does not tie into our immediate problem, the problem of the gas supply to the system of the Montana Power Co. as yet, because there are no fields producing wet gas, that is gas associated with oil in the area in which we expect to get our supply. If at any future time an oil field should be developed in that area, I believe that that statement would then hold with reference to that.

Q With reference to the Pakowki area?

A That is correct.

Q Could you conceive of the Pakowki Lake and Pincher Creek fields operating more or less as complementary to each other?

A No, I could not, because Pincher Creek is not an oil field.

Q No?

A In the first place, it is a condensate field, a field which requires expensive installations to remove the condensates, to treat the gas and an economic operation of that field would require a very high load factor. That is in order to keep your sulphur removal plant and all the other things, operating under economic conditions it should be produced as nearly as possible at a uniform rate. As a matter of fact, it has been my thesis in the later years that when Turner Valley becomes partially exhausted the operation of the reservoir in Turner Valley gas cap should be devoted to the creation of a storage reservoir to move up the gas from Pincher Creek and store it in this storage reservoir in Turner Valley and make it available for meeting the peak

day requirements of the Calgary system. I believe that solution of the problem is far better than using Bow Island because it is immediately adjacent to Calgary, where Bow Island lies at a considerable distance. Certainly the other requisites for any storage field mentioned by Mr. Davis are present there. Mr. Davis had not made a detailed study of the structure or of the geology. I believe after consulting with a number of geologists who are thoroughly familiar with it, that the evil does not exist there. There is a sufficiently small portion of the reservoir is segregated by faulting and that a highly desirable gas storage reservoir could be created there.

Q You can see a situation arising from the developmant of oil where it would not be good conservation to export dry gas out of the Pakowki Lake area?

A I do not know that I follow you. I do not see that the matters are related.

Q We were discussing the use of dry gas fields as supplementary to the production of gas - -

A Yes, I get what you mean.

Q Yes?

A It seems to me that is the reason for the thought that where you want to have your dry gas fields to assist you in your peak load is as close as possible to your market demand. The Pakowki Lake area is extremely remote, relatively speaking, from your load centre. I do not visualize Pakowki Lake as being a good peak load source

of gas. It would require long expensive transmission lines which would operate at a very low load factor and make the cost of the gas, well it would make Mr. Fenerty rise immediately.

Q Do you know the purpose for which the Pakowki Lake fields were originally explored, Mr. Dodge?

A Yes, I believe I do.

Q And that was what?

A It is my understanding at one time, before there was any considerable amount of oil development other than Turner Valley in this Province, that consideration was given to the manufacture of motor fuels from natural gas. I have been told and I believe upon good authority that the purpose of that exploration was, within the Pendant d'Oreille field at least, to develop such reserves of natural gas for that purpose.

Q To make synthetic gasoline?

A Yes. Now we have enormous oil reserves which have been developed in the province and it becomes an uneconomic project. And, as in the case of the Viking-Kinsella, you must turn to other markets for your gas.

Q You admit, as Dr. Beach did, that this export project in question now does not provide any more gas for Albertans or for Canadians?

A That is correct. It stands off by itself. I fail to see how it could economically be brought into the picture in comparison with other reserves that are more readily and more economically available.

CROSS-EXAMINATION BY MR. STEER:

Q MR. STEER: I think, Mr. Chairman, it will not be necessary for me to ask that Mr. Dodge be called tomorrow, but there is one question I would like to discuss with you, Doctor, and that is the thickness of the sands at the Jumping Pound field?

A Yes, sir?

Q You gave that as 147 and Mr. Davis gave it as 120. Will you tell us just how you arrived at your thickness of 147 feet?

A I think I have already stated that in this hearing in answer to someone else's question but I am willing to repeat it. I arrived at the thickness by a study of the information that was available in the office of the Shell Company in Los Angeles, drilling rates records, and such fragmentary core information as they had and a study of such electrologs as they had, and all the other factors which seemed to have a bearing upon that point. I did not, as mentioned by Mr. Davis, go and look at the gravel over at the Conservation office because during 25 years' experience it has been my conclusion that anybody that draws any conclusion at all regarding either thickness or porosity from ditch samples is deluding not only himself but his clients. I happen to be now the Vice President of a company which is probably the biggest core sampling company in the world, the International Petroleum Consultants Limited. We have had many, many years of core examination experience. I was amazed to hear Mr. Davis relate that he had determined the porosity by looking at it with a 13.2

magnification, and determined the thickness by looking at some gravel over at the Conservation Board.

Q What do you mean by "gravel"? Cuttings?

A Material that is washed up and is questionably related to any particular interval which is being drilled. I will be glad to explain how these cuttings are collected.

Q If you will allow me a moment, when you are talking about gravel are you referring to the same thing as Mr. Davis referred to as cuttings that are in the Conservation Board?

A I think so, yes.

Q How do these cuttings get into the Conservation Board office?

A I do not know, but I know how - -

Q For what purpose?

A I cannot tell you that. I know what I say how much they mean. What use the Conservation Board makes of them I do not know.

Q And if the Conservation Board engineer does use these cuttings, then you put him in the same category as Mr. Davis?

A No, not necessarily. It depends on what use he makes of them.

Q You are suggesting that magnifying 13 to 1 these cuttings will not assist you in ascertaining the porosity?

A I do, I am positive of it. I would like to prepare a number of samples and have anybody tell me anything about the porosity from them.

Q What you are telling us is, so far as you know there are no cores available with reference to the Jumping Pound field?

A I have not discussed cores at all. We have been talking about cuttings.

Q I am asking you to discuss cores now, if you please?

A O.K.

Q I have not asked anything of you up to date except with reference to some fragmentary cores, as you call them, in the Shell office?

A That is correct.

Q Are there any cores in the Conservation office?

A That I do not know.

Q Suppose there are no cores in the Conservation office and you were asked to determine the porosity of the Jumping Pound field and the thickness of the sand, you say that you could get no valuable information from these cuttings which are the only things in the Conservation Board office, on our assumption?

A Well, that may be your assumption but that is not the fact. The Conservation Board, as far as I know, has got all the information which the Shell Company has and from which I drew my conclusions. As a matter of fact, I have seen with my own eyes a letter prepared by the Vice President of the Shell Company which transmitted to the Conservation Board all of the data which I had with the possible exception of the drilling rate progress curves.

Q So that if Mr. Davis, in his examination, made use of that information and you made use of the information in the head office of the Shell Company, you and he came to different conclusions on the same thing?

A Well I do not know whether Mr. Davis made use of that information.

Q I am asking you to assume that he did. And assume that you made use of the information you had in the head office of the Shell. And assume that all that information was available for Mr. Davis in the Conservation Board office here. We come to the conclusion that you and he drew different conclusions from the same data?

A But surely I do not agree with your assumption, because that is not a fact. He did not have all the information. I have already testified I had in addition to the written data, talks with the Shell Company's engineers who were present when the wells were drilled and who assisted me in interpreting the written data which was in the office of the Shell Company in Los Angeles.

Q I see. So that the Conservation Board does not have all the information on which you based your conclusions?

A They do not have those engineers there, no, obviously.

Q So that you had some written data which you supplied to the Conservation Board and then you got the explanations of that written data from the Shell officials. You had that advantage over Mr. Davis in coming to your conclusions?

A I think you have the cart before the horse, Mr. Steer. The data that was supplied to the Conservation Board was the result of conferences which were held in this office and it contained any useful information which the Shell Company engineers were able to furnish.

Q Well then, we come back to the point that the Conservation Board did have all that information upon which you base your information?

A We are talking about two different things. These men furnished information based upon which certain calculations were made. The conclusions were embodied in a letter. The letter, together with all other pertinent data other than the oral comments of those gentlemen upon which the conclusions were based, were then sent to the Conservation Board. At a later date it was called to the attention of the Board that my analyses as to natural gas were erroneous and they were supplied by me at a later date with the corrected copies of the analyses, so that with the exception of the chain of events which resulted in these data, I think your conclusion is correct.

Q Well then, anybody who wanted to go to the Conservation Board office would have before him all the material upon which you based your conclusions when you were examining this question in the Shell head office?

A They should have. I do not know whether it is there or not.

Q Well then, if that is so, and if Mr. Davis and his assistants made use of that information which they got in the Conservation Board office, we come back to the proposition I put to you a moment ago, that on the same material you and he came to different conclusions, don't we?

A That is perfectly true.

Q Yes.

CROSS-EXAMINATION BY MR. FENERTY:

Q What you say, Dr. Dodge, in view of what I might say the remarkable discrepancies and opinions of various competent witnesses we have been hearing over a good many months, that the only safe way for this Board to proceed is to take minimums on all occasions?

A No, I do not believe so. I believe that the Board is intelligent and can see beyond the figures submitted perhaps for the parties for which they are submitted.

Q Take your opinions or take John Smith's opinions?

A No, I do not ask that they do that at all.

Q Aren't you driven to this, that if you are going to be on the safe side and if the geologists obviously are not too accurate that you must take the minimum? The alternative is to take you or somebody else and when we get out all opinions between you and others, don't you think we should take minimums if we are going to protect this Province?

A I do not. The reason I do not is that the whole purpose of taking expert testimony is to present and aid a Court or Board in the interpretation of the data before them.

Q And you do not think they should disregard this stuff we have been hearing altogether, in view of what has taken place today, do you?

A Well, I think maybe they would be ahead if they did.

Q Well, I am serious about that.

MR. STEER: I wonder if I may ask another question. You spoke of some fragmentary cores in the Shell office?

A Yes.

Q Can you tell me how many feet there were, if there were feet of it?

A The recovery was very poor. I looked at this material in January of 1949. I could not tell you how many feet.

Q I wonder why there would not be cores in the Conservation office. They are supposed to file them, aren't they?

A I guess they are if there is any left after they sample what they need for their own purposes. In the case of a very poor recovery there may not be enough for the geologists or the laboratories.

Q The cores you saw in the Shell head office were of no value to you?

A I did not consider them of any value.

MR. McDONALD: I have no questions.

EXAMINATION BY MR. C.E. SMITH:

Q Just one question, Dr. Dodge. Assuming that the plan as suggested by you, and I quite realize you say there may be other plans of supplying the requirements of the Province of Alberta and of the applicant, were put into effect, would it be possible for you to supply us with something similar to what you have done here by way of showing where, take the first plan, McDonald's outfit, Westcoast Transmission, where you would allocate to them to get some export of this gas, the 2 trillion you have at the bottom?

A Well, if the Board requested our company I am sure after a certain number of days of labour we might come up with something.

Q I am not being humorous about this. Assuming your plans, as suggested, and that is all you had, were put into effect and the Province protected in the way you suggest, the applicant was protected for its requirements in the way you suggest, could you then sort of allocate fields and deliverability and so on just, for example, Westcoast Transmission or Northwest or Pacific or any of them? You know what I am getting at?

A I know exactly what you are getting at. I think that would not be possible for several reasons. In the first place, to do that would probably require waiving by the Board of the 25% requirement on open flow limitations to cover peaks. I think there is plenty of gas. The question resolves itself entirely into one of deliverability.

Q And your present idea, if I understand you, is this, that assuming your suggested plan - -

A Yes?

Q - - with respect to Provincial protection and supply to the applicant, you being a witness called by that applicant, if that were put into effect, having regard to such things as you have just mentioned, it would be difficult for anybody as big as Westcoast or Northwest or any of these other people to get a supply of gas sufficient for all they have already suggested they require?

A I would like to qualify that a little further. We adopted for the purpose of answering the Commission's direct questions these schedules of average demand and

peak load requirements postulated by the Gas Company. That does not say for the moment we are in agreement with this. In order to properly answer the requirements I would have to make a study to see whether or not they are in agreement with it, which I am not in a position to state now. We have simply accepted them as a basis for calculation.

Q You go a little further than Dr. Beach did for the purpose of this submission only?

A We accepted them. We were not asked or empowered to make any study of the requirements of your Province. We felt we could give an honest and useful answer to the Board's request based on accepting them and that we could show that we had the deliverability to meet our own pipe lines. If I were asked to do anything such as you suggest in your last question, in justice to Westcoast or anybody else, I would want to critically examine the assumptions as to peak loads and so on.

Q As submitted by the two utilities?

A As submitted by the two utilities. That has not been done. That was not called for and so I do not feel I can answer your question completely, Mr. Smith.

Q Well, excepting their submissions then, we are in a bit of a dilemma. For instance, if the Board wanted to give the protection to the Province in the way you suggest, to give the applicant who has called you as a witness what they require, they would be in a bit of a difficulty in finding how they could do something really helpful for these other major applicants?

Dr. J. F. Dodge,
Exam. by Mr. C.E. Smith.

A I think that is correct.

Q But can you help me a bit on that?

A I think I have already gone as far as I can. I think there is none available. I think the whole thing is a question of deliverability and until greater deliverability is demonstrated to make available this 2½ trillion cubic feet which is left on the basis of presently known reserves, I could not answer that. It is my firm conviction that long before these fields will be needed or called upon to contribute gas in the magnitude that we have postulated for this, there will be other fields.

Q We all hope that.

A And perhaps two or three times as much reserves as we have now, so the whole thing gets to be hopelessly involved. We have merely answered here or attempted to make, as I said before, an honest answer to the Board's request as to whether or not the interests of the people of the Province of Alberta could be protected and at the same time the applicant have gas or not.

Q I quite appreciate that, and I think that is just what you have done between you and Dr. Beach. The only reason I asked the other questions, I wondered if you had considered that angle of it to such an extent that you could be of assistance here.

A That is why I showed that 2½ trillion feet left on that table.

Q I can see that at the bottom here. It is shown in such a way that I suppose the complications are very great. That is all.

CROSS-EXAMINATION BY MR. FENERTY:

Q My understanding is that these areas that McColl-Frontenac wants to export gas from are really not economically tributary to what you call the Calgary distribution system?

A That is my position, sir.

Q And in your opinion, does it follow from that that possibly no matter what our situation is about our reserves it does not affect this particular application? I was just wondering if that might not be the situation.

A I think that is entirely correct, and I think Mr. Davis started to lead a situation yesterday in which I thoroughly agreed, in which I testified before the Dinning Commission that unless producers are somewhere able to look for a gas market other than holding trillions of cubic feet in reserve for the local gas companies, development of gas in Alberta will cease and development of oil will slow down because if you find gas and can not market it and have to leave it sit there if the local gas company wants it in 1980, I do not think you are going to have very much incentive.

Q This particular application is not too much tied up with the general problems we have been discussing?

A That is right, it is not. It stands on its own feet.

CROSS-EXAMINATION BY MR. D.P. McDONALD:

Q If I might interrupt. Dr. Dodge, with respect to what Mr. Smith mentioned to you, you were familiar with the application of Westcoast in January and February of this year?

A Yes, sir. And I think in all fairness you might tell the Commission that before I undertook this employment I consulted with you as to whether or not it was not perfectly proper for me to proceed.

Q My answer was that you were an engineer and you would give evidence in the light of and according to how you saw the facts?

A That is right.

Q All I wanted to put on the record at this stage, Dr. Dodge, is this, do you recollect that a deliverability submission was filed, I think it was Exhibit 31?

A 31 or 32, yes.

Q Which was based on the requirements of the Westcoast field, I think, for 20 years, the Province of Alberta for 30 years, and in that particular submission there was no reference made to the Pakowki Lake area?

A That is correct.

Q And also that subsequently that was amended at the request of Mr. Fenerty to Exhibit 99, which was filed on April 13th, and in that particular exhibit there was no reference to Pakowki?

A That is correct.

Q But I think I should mention too that those exhibits were prepared in accordance to the estimates of market and peak day that were then available from the Gas Company's exhibit?

A That is correct, and I believe those have been amended upward materially since that time.

Q So that the situation has changed. I just want to place

that on the record at this stage so that reference can be made to it in answering those questions.

EXAMINATION BY DR. GOVIER:

Q Dr. Dodge, I wonder if you would help me on the question of porosity at Jumping Pound. I am very confused.

A Yes, sir.

Q May I ask your help by asking two or three direct questions?

A I would be very glad to answer them.

Q Did I understand you rightly when you said you made no use of any information on your inspection of the fragmentary cores?

A That is correct. I think I testified previously before this Board that my 12% was based entirely, after examination of such evidence as there was, upon an analogy to Turner Valley, that a very careful reservoir study had been made by Shell Oil Company engineers in which they showed that from material balance calculations that there must have been 12% net effective porosity as a whole in the Turner Valley field in order to contain the hydrocarbons which had been produced and which reasonably might be expected to be produced in the future, and of course, allowing for what was remaining at the pressures and so on. In other words, the material balance calculation with which you were familiar, if I did not know the space and knew everything else I could give you the space, and in despair, after having given up any other reasonable approach, I

took that because of the known similarity of structure, edge, degree of folding, and so forth, to be at least a reasonable basis for the estimation.

Q I think I understand that part of it, Dr. Dodge, but what I did not appreciate was that when you accepted this figure of 12% net porosity you accepted that without giving any regard whatsoever to fragmentary cores or cuttings, is that true?

A Certainly without giving any regard to cuttings because the cuttings, as far as I know, are of no use.

Q Well, that is the part I did not quite understand. I thought that it might be helpful to compare cuttings, say, in Jumping Pound with cuttings at Turner Valley to see if they were about the same.

A Well, I think that was done by the Shell Oil Company engineers. They informed me that in all respects they considered the reservoirs to be similar. I did not personally make a comparison.

Q Wouldn't it be fair to say that some value might be obtained from a section of the cuttings? I hate to think that we are keeping useless information in the Board office.

A Well, that would not be the first time, I do not believe. I would not go that far, though. Let me say this, I have been concerned with porosity and permeability matters for about 25 years. I started in 1926 with Standard Oil Company, 24 years. It is my general position that there is too much lag in the recovery of cuttings either of mud screen or by washing a portion of the screen to give

you an accurate correlation, even if you washed the pumps and calculated, and all that sort of thing, between the sample and the depth at which it is supposed to be recovered. Mud cuttings lodged on drill collars, every other way, weakens in my opinion the evidence presented by cuttings to the point that, well, I would not say they were of no use, I would say that anybody that could assign a degree of porosity down to 1% or 2% or 4% by looking at a bunch of cuttings is stretching his data.

Q Well, let me put it this way, Dr. Dodge. Suppose you had information on the porosity in one reservoir and you drilled into another reservoir and you had no cores except fragments, which you consider useless, and you wondered whether the porosity might be the same in the two reservoirs, wouldn't you look at the cuttings?

A I think I would, yes.

Q So they might have some value although naturally we would not carry it out to two or three decimal points?

A Well, I agree with you completely.

Q I think that clears it up. I have some other questions in connection with your J-11.

(Go to page 270)

Q On Page 3, Mr. Dodge, you indicate that the rest of this submission excludes consideration of the possible market or of the deliverability as applied to local systems. I just wonder whether you had anything further to add in that connection? That is, have you made any sort of study to see whether the reserves that you consider to be dedicated to local use are adequate to maintain deliverability in those local systems?

A Yes, Mr. Beach, I should say Dr. Beach and I went over that, and it seemed that almost without exception the reserves that were dedicated to that were far in excess of any reasonable requirement, and in some cases running 50 years or more.

Q So that without a detailed study you would say that that picture is prettywell covered?

A I think it is well covered.

Q Would you look at Table 4, Mr. Dodge?

A Yes, sir.

Q I take it that that is marketable gas in MCFs per day?

A That is correct. All these deliverabilities are marketable gas in MCFs per day.

Q Columns 1, 2 and 3 give the number of wells?

A Yes.

Q Can you tell me particularly with respect to Column 3 whether that represents the number of wells required to meet the deliverability demand you see here, or does it represent a potential economical possible number of wells?

A No, your first statement is correct.

Q Yes?

A That represents the number of wells or the nearest round

number to the number of wells which is necessary to meet the potential based upon the assumptions which we have made of 25% open flow, absolute open flow capacity at the pressure which we estimate for the reservoir at that time.

Q I see. And with respect to Columns 4, 5 and 6, am I right in assuming that these deliverability figures represent average wells as of that time and at the pressure that would exist in 1951, 1970 and 1980, assuming the withdrawal according to the schedule to follow?

A That is correct. The bottom hole pressure - in other words, they are absolute open flow calculations reduced to 25% based upon the calculated bottom hole pressure resulting from the withdrawals which we have shown on the succeeding Tables.

Q In that connection, Mr. Dodge, you have not attached any of the basic data on which those deliverabilities have been calculated, but perhaps you would indicate to me, say, in one case, let us take Viking-Kinsella, just how you arrived at those figures?

A In the case of Viking-Kinsella we took the curve which was furnished in Mr. Davis' application as being a typical Viking-Kinsella well, and transformed it or transmuted it into a 24-hour a day chart.

Q Is that the one that we were discussing with Mr.Davis?

A It is the curve that you were discussing with him the other day, that is, the Northwestern Utilities' curve which you discussed the other day. We took curve 2, which is a 10-hour well head deliverability.....

MR. McDONALD: 10-day.

A 10-day, pardon me, yes, but which the quantities are related in thousands of cubic feet per hour, and converted it into a chart of which, unfortunately, I have only the one copy, simply giving quantities in 24-hour days. I found that hourly business a little bit difficult to work with, and we took his chart and did it over into a daily form.

Q You have accepted this as a typical well, the deliverability chart?

A We thought it to be conservative. We found it somewhat less than some others we had seen. As long as we could meet the deliverabilities with this, which was the Gas Company's own figure, we thought we had better use it.

Q Mr. Dodge, do you have Exhibit J-7 handy?

A No, I do not have any of those, sir. I do have that curve, and that is all.

Q Well, I was looking at this curve the other day, and wondering whether it would be a typical one or not.

A Yes.

Q And then I looked at Exhibit J-7 and found on page 19 and found that the gas companies have provided us with an average of 75, I am sorry, an average of open flows taken on 75 different wells in the field, and that average comes out to 9.08, and then I thought, "Well, perhaps this Kinsella Number 30 is not a typical well," and that was the reason I asked Mr. Davis if he could give us any further information along thatline?

A Well, I heard some remarks about that, and I understood, perhaps erroneously, that the calculations that were made indicated that this was perhaps more conservative in the

matter of future deliverability than the result of the composite of the large number of wells of which you speak. I believe there was some comparison between 10 million as compared with 6 or 7 million, or something of that kind, in the testimony given yesterday. But we went to the Gas Company, and Mr. Arthur, who was associated with us in this study, he went to the Gas Company and was furnished with a separate copy of this curve, and it was the same curve as submitted in Mr.Davis' testimony, or his exhibit, and we took it as the best material which we could get under the circumstances and, as I say, the figures which you are now referring to in my submission here are based upon the use of that same curve only transformed into 24-hour days.

Q I see. And in the case of the other fields, Mr. Dodge, which produces sufficient gas, that is, excluding oil field gas, have you followed the same approach all the way through?

A We took open flows. I think I have a list of Black Butte. We took open flow tests on the Ellis sand which gave us 6 million cubic feet at 1488 pounds per square inch absolute, and used a .90 assumed slope. In the case of the Ribbon sand we have the same size, slightly different pressure, .90 assumed, and in each case we have taken the best data we could get and drawn curves. In the case of Jumping Pound we took the data from the Shell Company's test but we used an "N" factor of 10 rather than to go to a higher value. In the case of Manyberries we have a 24 million open flow at 1809 pounds per square inch, and a slope of .90 assumed. I would be glad to

have these prepared for your use.

Q Well, we do not like to ask for too much information, Mr.Dodge, but would it be very much trouble to make them?

A No, no trouble at all. I would be glad to have a set prepared. In fact, I think Mr. German could furnish you with a set within the next day or two. We have the negatives for those.

Q It would be or interest, if you could?

A Yes.

Q You have taken the back pressure?

A That is right.

Q And you have taken the open flow tests?

A That is right.

Q And you tried to get a typical well or an average well in each case?

A Yes. I might say in that connection, where we had, in fact, two drill stem tests, we found multiplying, or we have not multiplied those drill stem tests by any factor to get an open flow. We thought it more conservative to do that. We used a drill stem figure, I am looking at Black Butte, we used 6 million and an open flow based upon two drill stem tests, 6,250,000 and 5,800,000. Now, I think we would have been justified in assuming probably a considerably larger open flow capacity based upon the usual relationship that exists between the capacity of completed wells and the drill stem tests, but we did not do it.

Q Did you in any case add the amounts of successive drill stem tests to get the amount for the total section?

A No, we did not.

Q They are individual tests?

A They are separate open flow tests.

Q With respect to Table 6, Mr. Dodge, am I right in assuming that the first eight fields would be tied in to Northwest Utilities and the remaining five tied in with the Gas Company, was that the split you had in mind?

A Well, that was our first split that we had in mind, but some time later, if something does not happen to give you more gas, you are going to have to tie in the two ends of the Province together in order to get the deliverability, if you are going to meet the assumed peak then that the Gas Company postulates.

Q But that was the way that you roughly put in your dividing line?

A No, we did not put in our dividing line, except our first thought was that these fields naturally supply the Northwest system and these fields naturally supply the Calgary system.

Q Yes?

A But it becomes impossible. There is plenty of gas but it becomes impossible to meet the postulated peak day without an interconnection of the two systems some time in the future. I cannot tell you exactly what time, some time in the future, 10 or 15 years in the future. By that time there will be more reserves developed, so that the actual necessity for the construction of that line will not arise.

Q Mr. Dodge, I believe you were asked this question at an earlier sittings of these Hearings, but perhaps you have given it more thought, but in any case, you won't mind

repeating your answer? What do you think of the economics of gathering oil field gas at Redwater, gathering it, processing it, and making it available to market?

A I think probably today it would be uneconomical, but even fields with very low gas/oil ratios later on, having reference to their producing gas/oil ratios, do generally make it economic to do so. And certainly when the pressure is decreased and the recoverable gasoline content of the gas increased, I cannot tell you exactly when it happens, but I definitely think it will become an economic proposition at some time later.

Q Supposing the gas/oil ratio did not increase much, let us assume it won't?

A Yes.

Q Suppose it only increases 25%, what do you think of the economics of gathering that gas under those assumed conditions?

A Well, it is my understanding that the solution ratio is something on the order of 150 cubic feet per barrel per day. I am not completely conversant with the current producing gas/oil ratio, so that I cannot answer your question, but if it is on the order of 300 today, and it increases 25%.....

Q Let us assume it is 200?

A It may increase to 250?

Q Yes?

A I think you have put it on the border line, unless the gasoline content was very rich and the market for casing-head gasoline very strong, but on the basis of dry gas remaining alone, I don't think it could be done.

Q Would you care to add to that in thelight - let me start again. Would you care to modify your answer in any way in the light of possible separator pressure conditions?

A Well, I am not sufficiently conversant. What are they, two stages of wells up there?

Q In most instances they are single stages, in fact, I believe in every case.

A Frankly, I do not think I have given enough consideration to it to give you an answer which would have the meaning that it should have. I just have not given the problem study enough.

Q Yes?

A No, there comes a time both in terms of separator pressure and amounts of gas and the content of gasoline and the spacing of the wells, and all these other factors, where the recovery passes from an uneconomic thing into an economic thing. I certainly think it happens sometimes. It might not happen for a long time, and there is quite a difference in the producing ratio. It depends on a multiplicity of factors, and I wouldn't care to stick my neck out with regard to it right now.

(Go to page 278)

Q Let us assume some conditions, Mr. Dodge. Maybe you won't mind sticking your neck out a little bit to help out, supposing in Redwater the gas/oil ratio were 250 cubic feet per barrel, supposing the average sulphur content were 6% by volume, I hate to make things too high, and suppose the average separator pressure were below 40 pounds?

A What is the spacing of the wells? It is rather wide.

Q No, a 40-acre spacing.

A 40-acre spacing?

Q And supposing there are 500 wells for a 40-acre spacing?

A Yes.

Q Just offhand, would you stick your neck out and help us, stick your neck out a little bit and help us?

A I think you are still a little bit too low in your gas/oil ratio.

Q Supposing the gas/oil ratio is 400, do you think offhand it might be reasonable?

A Yes, it might be reasonable.

Q Well, that is some help. I have just two more little questions, and I think I can finish, Mr. Dodge. On table 6 where you list the Excelsior field, that is oil field gas, is it, or is it a combination?

A I think my recollection is that it considers the total - I will have to look at it. No, I believe we considered all the gas that was available there from the standpoint - well, we have carried over from Dr. Beach's table 400 6/10 billions, and we have characterized the possible occurrence of gas in the Viking as presently indeterminable, so the

actual amounts we have used there is against the 400 6/10 billion.

Q It is not oil field gas?

A Yes, it is not oil field gas, that is correct.

Q Stettler, that is oil field gas?

A Yes, Stettler is oil field gas.

Q Of course, it really does not matter on table 6, does it?

A No, it does not.

Q Does it matter anywhere?

A No, I do not believe it does.

Q Yes, because it does in table 7?

A Yes, pardon me, it does.

Q Could you make any comment concerning the economics of gathering that gas, Mr. Dodge, or would you prefer not to?

A I would not like to. We have assumed it would be completely uneconomical until a later period in the life of the property. As you will notice in table 7 we did not pick it up until 1954 and that was based on a rather horseback figure of increasing the gas/oil ratio. Unless you would like me to prepare a study on it I would not like to make any more remarks on it.

Q I imagine your general remarks would be applicable?

A They are. That is correct.

Q Mr. Dodge, if you will be here tomorrow morning, I might want to ask you one or two further questions, or are you planning on going?

A I was planning on going home. I have a number of matters waiting in the office there.

Q Well, I think there is about one minute left?

A We are always subject to the Board's pleasure on that.

Q Very briefly, Mr. Dodge, I wondered if you could add or give us your own views on the question that we were discussing with Mr. Davis earlier this morning relating particularly to economic spacing of wells, and whether you would agree with Mr. Davis or whether you would not agree with Mr. Davis?

A I think Mr. Davis is extremely conservative. I remember particularly wondering about this matter of applying the heavy tax rate to income before you recover the cost of the well. Don't you have deductions from income while you are still depreciating or recovering your invested capital?

MR. STEER: There is 25% depletion deducted.

A Your 25% applied to 25% of the income without relation to the question of invested capital? I was wondering about that. I am not sufficiently familiar with your tax laws to enter into a discussion of a topic like that.

THE CHAIRMAN: Can't you write the wells off? Can't you do it as quickly as you wish?

A That is my understanding.

Q I don't know whether you can write those wells off as quickly as you want, but that is my understanding.

MR. STEER: I would have to find that out. I thought what was being referred to was the 25% that was deducted for depletion.

MR. McDONALD: Mr. Chairman, I think the position is that you write off your investment and then you are

entitled to depreciation at 33-1/3% of your net revenue, and then you take your 43% of the balance with regard to the first $10,000 profit.

A My understanding was not in accord with the financial treatment or results of the thing given by Mr. Davis.

Q Apart from the financial calculations which were mentioned before - -

A Yes.

Q - - what do you think about the general approach?

A I think the general approach is sound, is a sound one, only I would be much more optimistic if I could get my money back three times in addition to the cost of the well. In that case I would be enthusiastic rather than pessimistic.

Q Well, what do you think about that factor?

A Well, when I was doing work for the Standard Oil Company we used to say if we could get our money back in five years, it was all right. With regard to Mr. Davis' 44% factor, I do not think you would be drilling wells to supply demand and then operating them on a 44% load factor, so that with a reasonable load factor, if I could get my money back in five years, I would think it was all right, especially if I was going to get my money back two or three times over 20 years.

Q Supposing your market has a 44% load factor?

A Well, you are taking gas from other places. As I understood the case to be, the drilling of additional wells was to meet the demand, also peak load demand, and actual demand, and if you are meeting peak load demand from those your load would not be there. This matter would always

be more for peak load gas than regular gas, so that does not seem to me that it is an unfair burden on the well. If I was going to drill these wells it would be in response to either a demand for average load or for peak load, in which case the financial consideration would be entirely different.

Q Well, if you add it all up, Mr. Dodge, how many wells would you suggest as the economic maximum in the Viking-Kinsella field?

A Something on the order of 200. We used 178 because we needed 178 to make it meet the demand, but I am a great believer in closer spacing and greater recovery. Our recovery, incidentally, our estimated recovery is completely in accord with Mr. Davis' experience factor in that we get 87%, and his actual calculated factor is not in accordance with his experience factor, it is only 85%. Ours happens to coincide exactly with his figures.

Q Thanks very much, Mr. Dodge.

A Thank you.

MR. C. E. SMITH: I wonder, before you rise, sir, if I might mention something?

MR. DODGE: Oh, yes.

MR. C. E. SMITH: Not you, Mr. Dodge, I was talking to the Chairman, and I want to mention it to counsel too. You will remember at the hearing earlier it was arranged that Mr. Liesemer and Mr. Crockford, who are engineers and geologists of the Board, would be giving a submission, and at that time it was understood that they would have an opportunity of some few weeks after everybody had been

heard to prepare their submission. In view of what has occurred recently with respect to the Joint Hearing and so on, I have asked them particularly to hurry up, instead of taking the time that they had anticipated, thinking they would have a longer opportunity of preparing it, and they have prepared, or at least one of them has, and the other will be available Friday, submissions absolutely independent of this Board, and I have requested that particularly, and not reflecting the opinions of the Board, the Board knows that itself. I do not think the Board has seen them yet. But they are prepared without the advice or the influence, directly or indirectly, of the Board. And I wanted to explain that to counsel so that they will realize when Mr. Liesemer or Mr. Crockford appears before this Board, he will be like Mr. Davis or Mr. Dodge or anybody else. I have here this morning, gentlemen, Mr. Liesemer's submission, which will be available as soon as the Board recesses and we will have Mr. Crockford's available by Friday. It is on the machine, or whatever you call it, now. They have done the best they can to get them to you as soon as they can, having regard to the plans that they understood that they were operating under some time ago.

MR. MACLEOD: Mr. Chairman, I just had a question or two to ask Mr. Stadler. He would like to get away as soon as possible.

THE CHAIRMAN: How long would it take?

MR. MACLEOD: I would ask him just one question.

THE CHAIRMAN: Well, do you want him on the stand now?

MR. MACLEOD: Yes.

MR. C. E. SMITH: Can't this witness wait until tomorrow?

MR. MACLEOD: Well, I could, but I would like to, or he would like to get away. It will be only a minute or so.

MR. C. E. SMITH: He may be a lot longer than that.

THE CHAIRMAN: All right.

MR. MACLEOD: Well, we will see how he turns out.

(Go to page 285.)

LOUIS S. STADLER, having been duly sworn, examined by Mr. Macleod, testified as follows:

Q Mr. Stadler, you are an officer of the Montana Power Company?

A I am manager of the Gas Division of the Montana Power Company.

Q Manager of the Gas Division of the Montana Power Company?

A Yes, sir.

Q And you are acquainted with the information that the Board asked to be supplied with?

A Yes.

Q Such as the Board expects to receive some assurance from the various producers to the effect that given a market that they would be prepared to drill the wells required to meet the deliverability schedule. You are acquainted with the deliverability schedule for Montana?

A That is correct.

Q As given by Mr. Dodge?

A Yes.

Q Can you say whether your company, if it is given a permit, is prepared to drill the necessary number of wells in the area referred to as the Pakowki Lake area to meet the deliverability schedule?

A Yes. The Montana Power Company is prepared to meet the deliverability schedule and drill the number of wells that meets that schedule.

MR. NOLAN: I am sorry, I did not hear the company you represent.

A The Montana Power Company.

Q MR. STEER: I understand you would be drilling the wells?

A Yes, sir, under a purchase arrangement.

Q MR. NOLAN: Have you not some agreement between the Montana Power Company and the McColl-Frontenac and the Union Company?

A Yes, sir, we have.

Q Can you tell me the terms of that agreement?

A I am generally familiar with that but I assume that would be more fitly submitted at our application hearing that is scheduled for December 4th. However, that is the pleasure of the Board.

THE CHAIRMAN: I think unless the matter is to deal with the matter of reserves it could be better dealt with at that time.

MR. NOLAN: It does not deal with the reserves but it is information we thought would be useful to the Board.

THE CHAIRMAN: I think that will be brought out when their application is heard.

MR. MARTLAND: No doubt somebody will be produced at a later stage from the Montana Power Company?

THE CHAIRMAN: Yes, their application is set for December 4th.

MR. MACLEOD: On December 4th, we propose to bring the Vice-President of the company here at that time.

Q THE CHAIRMAN: As far as the drilling of wells is concerned, as I understand it, you only have an

assurance as far as the areas controlled by your own company?

A That is correct.

Q That does not maintain as far as any of these other fields are concerned, in accordance with this deliverability schedule?

MR. MACLEOD: This is designed to meet the deliverability schedule for Montana.

(At this stage the hearing was adjourned until 9.30 A.M. November 2, 1950.)